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Calamine Mines of Sardinia

By Charles W. Wright*

SYNOPSIS—The calamine mines of Sardinia are comparatively recent discoveries in a very old lead-mining district. Mining is by opencut and by overhead stoping and filling. Machine drills have only recently been introduced. Development work presents many possibilities still.

Although Sardinia is one of the oldest lead-silver mining districts in Europe, the value of its large calamine deposits remained unknown until 1865. It was then discovered that the heavy rock that accompanied certain of the lead ores was calamine and that there was a market for it. The development of the known deposits and explorations for new deposits began immediately, and 92,000 tons of calamine was produced in 1870. The output was gradually increased to 127,000 tons in 1900 and since then the annual extraction in the district has varied from 100,000 to 130,000 tons which, valued at the ports in Sardinia, amounts to from 10,000,000 to 15,000,000 lire ($1,930,000 to $2,895,000).

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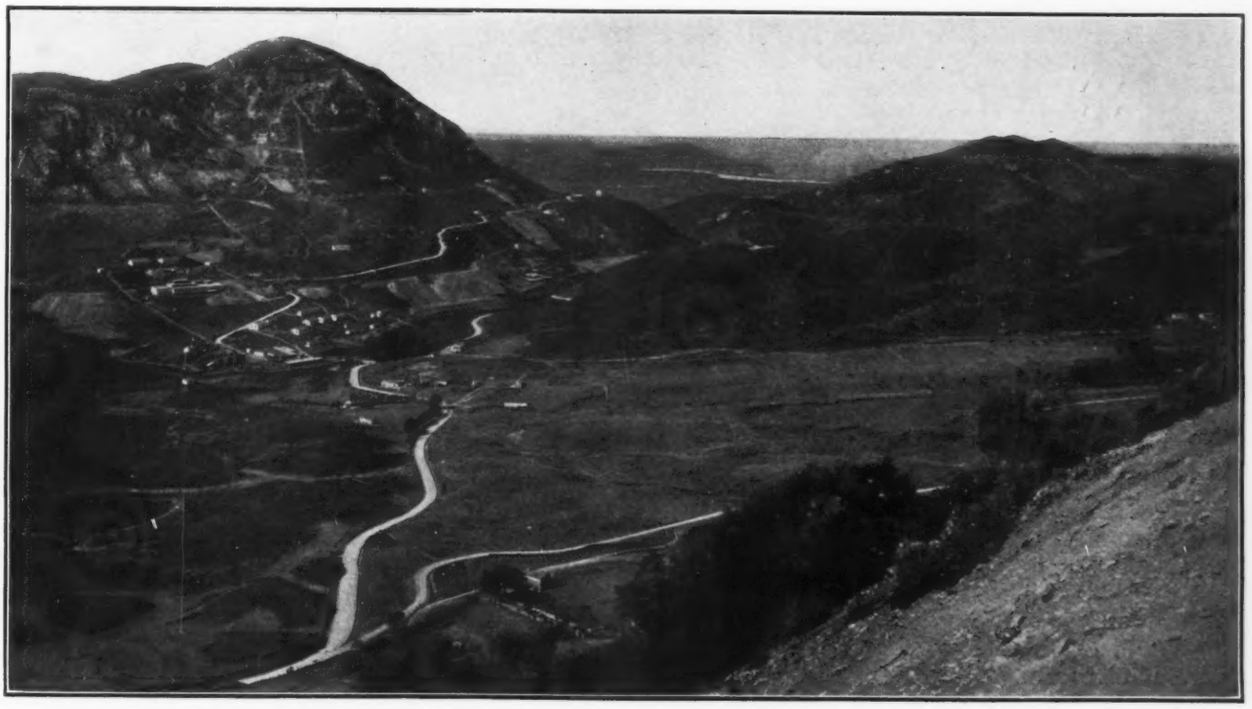
The calamine mines are situated for the most part in the Iglesias mining district, which occupies a mountainous area on the southwest corner of the island.

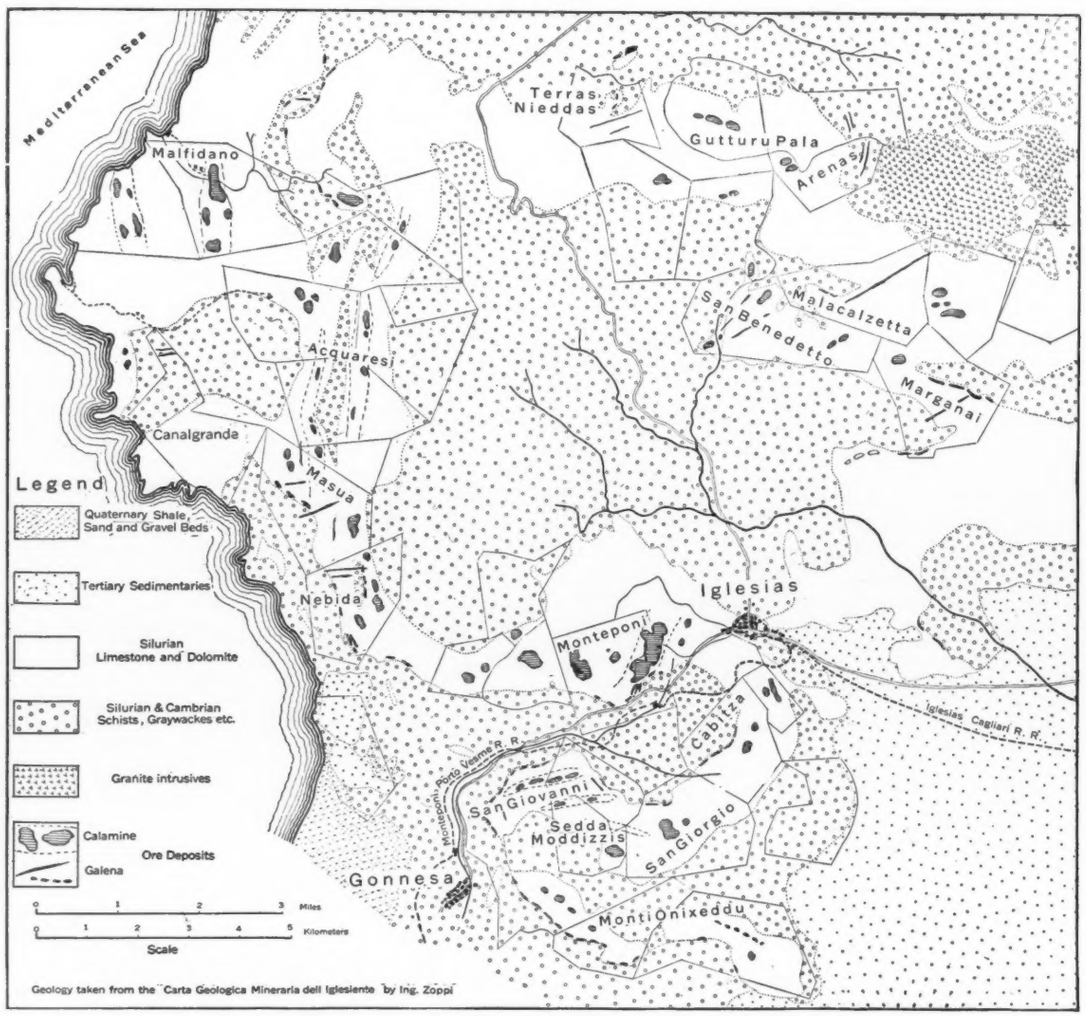
A small-scale geologic sketch map of a portion of the Iglesias mining district, in which these deposits occur, is added to show the general distribution of the rock formations and the ore deposits. The oldest rocks exposed in the Iglesias district appear to be the Cambrian schists, which contain fossil evidence, principally trilobites, at Canalgrande and in the Iglesias basin at Cabitza and other points. In the limestone beds Silurian fossils have been found at many points, and overlying these, other schist beds occur which are also believed to be of Silurian age. Dolomite in stratified beds and as masses in the limestone is of common occurrence. Overlying the Paleozoic rocks and occupying the lowlands to the south of this mining district are Tertiary beds of sandstone shale and conglomerate. In these, important beds of lignite occur. Still more recent are the lava beds, which in turn overlie these Tertiary beds.



GENERAL VIEW LOOKING SOUTH FROM MONTEPONI TOWARD THE SAN GIOVANNI MINE, SARDINIA

The calamine deposits are confined entirely to the limestone areas, and their occurrence is along zones of

fracturing which are parallel to the structural lines of the inclosing rocks. These mineral-bearing zones vary in width from 20 to 100 meters or more and are often a few kilometers in length. Within the zones the extent of the minable ore deposit is rarely defined by walls of waste and the limits are determined by the amount of calamine present. The ore masses mined are usually from 2 to 20 m. wide and from 10 to 100 m. in length. Usually several important ore masses occur along the same mineral zone and in the same mine. Along



MAP OF THE LEAD-ZINC DISTRICTS OF SARDINIA

certain of the mineral zones there are two or three mines, and at some of them two or three parallel zones have been developed. In one instance—at Monteponi—the entire mineral zone is being mined by large openpits a few hundred meters in width and several hundred in length.

Ore Deposits in Tilted Limestone Beds

The form of the deposits depends upon the character of fracturing of the limestones within the mineral zones. At the Acquaresi and adjoining mines the limestone beds, although steeply tilted, show but little transverse fracturing or faulting. The calamine occurs in fairly regular veins interstratified in the limestone, and where such veins are found sufficiently close together or are wide enough to be mined separately, they constitute an orebody. Other deposits consist of a confusion of limestone blocks cemented together by calamine and calcite. An example of such deposits occurs in the area of brecciated limestone and dolomite at the San Giovanni mine, and although these are quite extensive and contain rich ore, locally, they are less regular and less uniform in their zinc content than the Acquaresi type. Another type includes the superficial deposits such as at the Arenas mine, which consist of calamine and limonite ore filling basins in the eroded limestone. These deposits are not extensive in depth and are less important than the others.

As to the formation of the ore it is evident that this has been deposited from mineral-bearing waters circulating along the fracture zones in the limestone, and in certain instances the mineral-bearing solutions appear to have dissolved the limestone-inclosing rocks along their course and thus to have formed their own channels and chambers, in which the present ore masses are found.

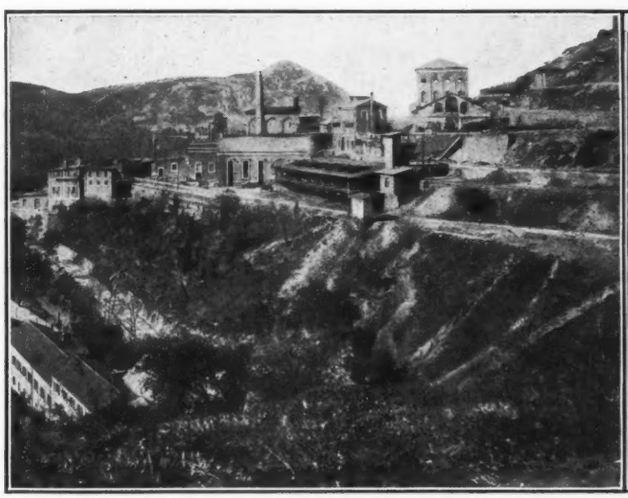
Originally these ores consisted of veins of sphalerite, pyrite and galena interstratified in the limestones and in masses replacing it. The calamine deposits grade into the sulphide deposits in depth at certain of the mines, while at others masses of calamine ore extend below the lowest levels—in some instances are below sea level.

The alteration of the original sulphide ores to oxides, carbonates and silicates has probably been due to the action of meteoric waters that circulated along the mineralized calcareous strata, dissolving the sulphides and precipitating the zinc and lead in some as carbonates and silicates. This process has caused but little transfer of the ores. One usually finds some galena with the calamine; and more rarely some blende is present, showing that alteration of the ores has been in place. As gangue mineral, calcites predominate and in some of the orebodies barite and quartz are present. Limonite often occurs in large amounts associated with the calamine; also argillaceous matter where structural disturbances have occurred in the orebodies.

A study of the deposits reveals that after the initial fracturing of the limestones the cementing material along the strata and in the brecciated areas was essentially calcite, while subsequent fracturing was succeeded by the introduction of the calamine and limonite, which also serves as cementing material. Many small seams and masses of limestone in the calamine deposits show a development of calcite adjacent to the limestone walls or included masses, indicating that the deposition of the calcite is anterior to that of the calamine. The finding of these calcite veins and masses in the limestone is usually a good indication of the vicinity of calamine ore. In the calamine masses druses are often present containing small crystals of calcite and occasionally of barite, although such occurrences are later than the calamine. Quartz is of rare occurrence, though the silicate of zinc is usually present with the carbonate, which is the principal ore. The term calamine is applied to the ore, though technically it is essentially smithsonite.

As to the age of these deposits, it is evident that the fracture zones in which they occur were developed after the limestone strata had been tilted to their present positions. As Devonian strata are interfolded with these Silurian limestones, it follows that the calamine deposits are of post Devonian age. Relatively flat-lying Tertiary strata constitute the next rock formations within the district. As no zinc deposits have been found in these Tertiary beds, they are considered to be of more recent age than the ore deposits.

The ore mined has a zinc content of from 15 to 25%, while an average content of the mineralized zones such as are being mined at Monteponi is from 8 to 12%. At the mines about two-thirds of the production is made by hand sorting, the calamine of which contains from 42 to 48% of zinc, and one-third is produced in the ore-dressing mills, which yield a calamine containing from 30 to 38% zinc. The iron content of the hand-sorted ore is usually from 6 to 8%, while that of the mill product averages from 15 to 30%. Where lead ore occurs with the calamine, as is usually the case, the calamine concentrates often contain from 4 to 8% in lead and the lead concentrates carry as high as 12% in zinc.



VIEW OF THE MONTEPONI MINE PLANT, SARDINIA

OPENCUT WORKINGS AT THE MONTEPONI MINE

Calamine Sometimes Associated with Lead Ore

Besides the calamine some of the deposits contain lead ore in the form of galena partly altered to cerussite. At certain mines the lead content of the ore is nearly as valuable as the zinc content, while at other mines it is unimportant. Subsequent to the formation of the calamine deposits more or less movement within the mineralized areas occurred, principally parallel to the stratification of the limestones, and caused the development of the argillaceous matter and slickensides that occur frequently.

Description of the Mines of the District

The principal calamine mines of the Iglesias district are Monteponi, Buggeru, San Giovanni, Acquaresi, Masua, Nebida and San Benedetto. In normal times the production of each of the first two mines averages from 28,000 to 33,000 tons of calamine annually. The next two produce from 7,000 to 10,000 tons each of calamine and the last three average from 5,000 to 10,000 tons each annually. Besides these there are several small properties that produce from a few hundred to a thousand tons annually. The average annual production for the last 10 years has been approximately 125,000 tons of calamine.

Many of these calamine mines are important producers of lead ore and at the present time it is their lead output that permits them to continue operations at a profit.

In the district there are several important mines that produce lead ores only, and two important producers of blende.

The mining costs at these mines are calculated per ton of calamine produced, regardless of tenor in zinc. However, the average content of the concentrates from a mine does not vary greatly. In normal years the total cost per ton of production is from 75 to 105 lire. This cost is segregated and distributed into departments in the manner shown in the following table:

COST OF ORE PRODUCTION

Developments	12-15 lire per ton
Mining	25-35 lire per ton
Ore dressing	13-19 lire per ton
Calcining	6- 9 lire per ton
Transport	4- 7 lire per ton
General expense, royalties, etc.	15-20 lire per ton
Total	75-105 lire per ton
Average	90 lire per ton

The developments usually consist of driving along the mineral zones and crosscutting at intervals to explore for rich calamine masses.

The mining method consists of overhead stoping and filling with waste, which for the most part is sorted in the stopes from the broken ore. Much timbering is often necessary to hold up the ore masses, or pillars of ore are left. For the ore masses that occur near the surface, the ore is mined by large openpits. One of the largest of these open workings is at Monteponi which is 300 m. wide and about 600 m. long and over 100 m. in depth.

The mining is being carried on mostly by hand-drilling, though during the last few years machine drills have been introduced. At certain of the mines practically all the underground work is now being done by machine drills.

The ore dressing consists of a careful sorting on the "piazzale" at the mouths of the tunnels where calamine product, mill ore and waste are made. The hand-sorted product is sent to vertical calcining furnaces, where it is calcined before shipping. The mill ore is sent to the mill, where it is first crushed to under 1-in. size and the size from ½ to 1 in. is jigged. Both the products and tailings from these jigs are hand-sorted by boys. The ore under ½-in. size is concentrated in jigs and on tables. The zinc recovery from the ore treated in the mills is from 50 to 60%, the tailings from the mills averaging from 8 to 12%. The mill product is calcined in revolving furnaces, increasing by about 5% the tenor of the calamine.

From some mines the product is transported to the sea and sent in the smaller boats to the port of Carloforte, at the south end of the island, while from other mines it is delivered to the railway and sent to the port of Cagliari or Portovesme. Thence the ore is shipped to the smelters in Belgium and Germany, although at present shipments are being made to England.

The average tenor of the calamine shipments in 1913 was 40.65% zinc. The average selling value of this product delivered at the ports in Sardinia was about 120 lire a ton.

Future of the Calamine Mines

Although the mining of calamine in Sardinia was begun nearly 50 years ago, only a small portion, relatively, of the mineral zones has been explored. The developments that have been made in recent years have been especially successful, and those mines that have extended their explorations now have sufficient ore reserves for the next 6 to 10 years at their present rate of output, while their tonnage of possible ore is about double that of the reserves. At the Monteponi mine it is claimed that the ore in sight is sufficient for the next 40 years. At this mine practically the entire mountain is being mined as is shown in the photograph. It is therefore probable that the Iglesias mining district will continue producing calamine at its present or an increased rate of output for the next half-century.

The Newnam Hearth*

The smelting of galena in the ore hearth has been practiced in many countries for several hundred years with varying success. In the United States the water-jacketed American hearths and the Jumbo hearths have found some favor in the Missouri lead belt, where large quantities of nonargentiferous galena concentrates are produced.

In form and method of operation the ore hearth has changed but little since its earliest conception. Since its field is restricted to nonargentiferous galena containing over 68% of lead, its use is limited to a few districts; and, on account of certain disadvantages attending its operation, modern sintering and blast-furnace practice have nearly driven it out of the Missouri field.

It is not generally known that the cost of producing pig lead is smaller by the hearth method than by sintering and blast-furnace smelting. Yet it is doubtful if any metallurgist knowing this to be true would recommend an American hearth installation—by reason of the disadvantages which will be briefly enumerated.

Disadvantages of the Ore Hearth

The furnace has been limited to a length of from 4 to 5 ft., requiring for its operation two men working an 8-hr. shift as a maximum. The product per man is small, the work is hot and laborious, and the difficulty of completely removing the dust and fume has made it a notorious source of lead poisoning. Although suitable for operations on a small scale, a large number of hearths would be required for a plant smelting 10,000 tons of 68 to 70% concentrates per month; and the number of semiskilled laborers would be six times the number of hearths—a condition which is prohibitive.

On account of the high percentage of dust and fume produced, a large flue and baghouse installation is required, and in the past the handling and retreatment of this dust and fume has been a serious problem.

On the other hand, the advantages are the immediate reduction of from 55 to 65% of the lead contents of the concentrates, with simultaneous roasting, thus producing a small tonnage of gray slag, which is an ideal product for the lead blast furnace, since it greatly accelerates the furnace operation and is productive of but little matte, the lead being largely present in the form of sulphate and oxide. As previously observed, the cost per ton of pig lead is somewhat cheaper by this method.[1]

Several attempts have been made to raise the tonnage and reduce the labor on the ore hearths by mechanical means, but up to the present without success. It is the

*Excerpts from a paper by William E. Newnam, to be presented at the February, 1916, meeting of the A. I. M. E.

[1] It may be of interest at this point to note that the lead blast furnace carrying a charge with 20% of gray slag is smelting 7.5 tons of charge per square foot of tuyère area per 24 hr. The lead in this slag is under 1% and the proportion of fixed carbon consumed per charge 7.5%.

purpose of this paper to describe a new and more fortunate endeavor in this direction.

After a careful study of the hand-hearth operation, it was decided that three things were necessary to perfect it, namely: A cool and sanitary hood; a mechanical rabbler that would effectually replace the continuous and laborious use of the hand rabble; and a lead-well attachment that would mold clean lead direct from the hearth basin with little attention on the part of the furnacemen.

All our experiments were carried out on the ordinary 4-ft. hand hearth. The hood problem was taken up first, and soon a double hood was devised which gave the furnace room a clear and fume-free atmosphere, at the same time reducing the direct and radiated heat to the workmen by 50%. A complete cessation of sickness and an increased output were at once noted. After a few trials a simple and effective lead well and molding device was installed. A traveling rabbler was next put on the 4-ft. furnace, and after numerous changes a successful type was worked out.

Mechanical Rabbler the Chief Stunt

This rabbling machine is hung from a carriage which travels on an overhead track, and it rabbles in one direction only, for a reason given later. The machine being in such a position that the rabble arm is at the extreme end of the furnace, a releasing lever is pulled, which starts the machine, causing the rabble arm to describe a motion similar to that of the hand rabble, but more effective, since there is more power behind it. As the rabble arm is withdrawn from the fire, an eccentric connected with a ratchet wheel moves the carriage forward about 4 in. for the next stroke of the rabble arm. This motion is repeated until the other end of the furnace is reached, when the machine automatically stops and withdraws the rabble arm from the fire.

Two men, a charger and a helper, operate the furnace. The helper follows close behind the rabble arm and with a long-handled shovel pushes back the loose charge, picking out the gray slag as he goes along. Close behind him comes the charger, who spreads a thin layer of ore on the charge as fast as it is shoveled back, adding coke breeze as needed.

Thus the fire is exposed for an instant only, and by the time the trip down the furnace is completed, the end first charged is ready for the rabbling machine. It is for this reason that the rabbling is performed in one direction only. The first trip being complete and the gray slag removed from the apron, the throwing-in of a clutch causes the carriage to return without rabbling to its original position, where it automatically stops in readiness for a second rabbling trip.

Thus on each trip the fire is rabbled 24 times in 48 sec., the return motion requiring 12 sec. One horsepower is required under full load and is supplied by a 1-hp. alternating-current 220-volt motor. The rabbling machine is simple, strong and durable and only requires a few minutes' attention daily.

From the data compiled it was determined that the hearth could be increased to 8 ft. in length, that it would then produce 2.5 times as much pig lead as the hand hearth, and that two men could operate it with less fatigue than that sustained by two men on the ordinary hand hearth. An 8-ft. hearth was at once constructed, and from the first day of its operation it has not only realized our expectations, but considerably exceeded them.

As direct-hearth labor is paid a certain rate per hundred pounds of pig lead produced, it will be seen that the cost of production, as well as the number of furnaces and number of men employed, has been more than cut in half. Moreover, the hearth laborers can earn more money per shift, through the increased efficiency per square foot of hearth area; and this, in turn, enables us to secure a more desirable class of men.

The following tables show that the 8-ft. furnace gives a much higher extraction of metallic lead, with a corresponding decrease in the amount of dust and fume produced.

Another gratifying feature is the reduction of the fuel added in the form of coke breeze. Whereas the hand hearth uses from 8 to 9% of fuel, the 8-ft. mechanical hearth consumes from 3 to 4%; only it is probable that the decrease in dust and fume, as well as in fuel consumption, is due to the shorter time the fire is exposed after rabbling on the 8-ft. hearth.

It has been found that by pugging the flue dust with a certain cheap chemical and mixing it with a portion of burnt baghouse fume, the mixture can be successfully worked up on the hearth, giving a high lead extraction and a very low percentage of dust and fume.

Thus it will be seen that for galena concentrates of over 68% lead content, the disadvantages of the old-style hearth have been overcome and the cost of production has been lowered to such a degree that sintering with subsequent blast-furnace smelting is no longer comparable therewith.

Smelting Flue Dust on the Hearth

The following is an average of the results obtained by smelting a mixture of pugged flue dust and burnt baghouse fume. This mixture is made up so that the average weight of pig lead produced per shift will be approximately the same as that extracted from 70% galena concentrates.

Owing to the low percentage of sulphur present in the mixture as sulphides, 10% of coke breeze is required.

Burnt baghouse fume, containing 76% and pugged flue dust containing 62% are made into a mixture containing 67% of lead. Of this lead 81.3% passes into pig lead, 10% into gray slag and 8.7% into fume and dust.

The gray slag contains: Pb, 32.4; FeO, 41.7; CaO, 11.1; S, 1.2; and insoluble, 18.7%.

The following table is a comparison of the two types of hearth, operating side by side on the same ore, showing the average results per 8-hr. shift over a period of four weeks, the labor being the same on each type.

COMPARATIVE RESULTS ON NEWNAM AND HAND HEARTH

Ore charged, galena concentrates, containing 72.5% lead, and 15.1 sulphur.

	Newnam Hearth, Lb.	Hand Hearth, Lb.
Dry ore charged	13,179	5,091
Lead contents	9,554	3,691
Pig lead made	6,443	2,030
Gray slag made	3,318	1,329
Per cent. of coke breeze used	3.6	8.8
Rabble trips per hour	37.2	....
Percentage of Total Lead in Products		
Pig lead	67.44	55.00
Gray slag	15.18	16.20
Dust and fume	17.38	28.80
	100.00	100.00

Analysis of Gray Slag	Pb	FeO	CaO	S	Insoluble
Newnam hearth	43.7	12.8	9.9	1.9	12.6
Hand hearth	45.0	12.2	9.0	2.6	12.2

The lead present in the gray slag is approximately combined as follows:

	%
$PbSO_4$	10.0
PbS	6.0
PbO	25.0
Metallic lead	8.5

From the standpoint of roasting, the elimination of sulphur on the hearth is high in comparison with the other methods now in vogue.

Of the material drawn into the flues and bag chambers the proportion by weight is one of dust to two of burnt fume. From the analyses given below it will be seen that a considerable portion of the lead is present as sulphate, and on retreatment the sulphate, reacting on the sulphide, greatly assists the desulphurizing process.

	Pb, %	S, %
Dust	62.0	11.1
Burnt fume	76.0	5.9

The lead present is combined approximately as follows:

	Dust, %	Burnt Fume, %
$PbSO_4$	18.9	53.6
PbS	55.4	1.2
PbO	2.0	41.5

Taking the foregoing average runs as a basis, the sulphur elimination is calculated as follows:

NEWNAM HEARTH

	Lb.	Sulphur, %	Sulphur, lb.
Dry ore charged	13,179	15.1	1,990
Gray slag	3,318	1.9	63
Dust	776	11.1	86
Burnt fume	1,552	5.9	92
Pounds of sulphur eliminated	.....	....	1,749
Per cent. of sulphur eliminated	.....	....	87.9

HAND HEARTH

	Lb.	Sulphur, %	Sulphur, lb.
Dry ore charged	5,091	15.1	769
Gray slag	1,329	2.6	35
Dust	497	11.1	55
Burnt fume	994	5.9	59
Pounds of sulphur eliminated	.....	....	620
Per cent. of sulphur eliminated	.....	....	80.6

In several localities the ore hearth has been operated on high-grade galena containing about 80% lead, with an extraction of from 80 to 85% of the metal. In order to determine the adaptability of this grade of ore to the Newnam hearth a test run was made, the average results of which per 8-hr. shift are given here:

TEST ON GALENA CONCENTRATES, CONTAINING 82.0% LEAD AND 11.2% SULPHUR

	Lb.
Dry ore charged	14,436
Lead contents	11,837
Pig lead made	10,790
Gray slag made	1,075
Per cent. of coke breeze used	2.4
Per cent. of crushed limestone	2.0

Percentage of Total Lead Products

Pig lead	91.15
Gray slag	4.25
Dust and fume	4.60
	100.00

Sulphur Elimination

	Lb.	Sulphur, %	Sulphur, lb.
Dry ore charged	14,436	11.2	1,617
Gray slag	1,075	2.5	27
Dust	254	11.1	28
Burnt fume	508	5.9	30
Pounds of sulphur eliminated	.....	....	1,532
Per cent. of sulphur eliminated	.....	....	94.7

Beaver Consolidated Report

For the quarter ended Aug. 31, 1915, the Beaver Consolidated Mines, Cobalt, Ont., reports that 1,600 ft. of development work was performed and 1,133.5 cu.yd. removed in stoping. The main shaft is down to 1,100 ft. and will be continued until it reaches the lower contact between the diabase and Keewatin formations. Additions to the mill will increase its daily capacity to 150 tons. Owing to the low price of silver, the company now has 235,075 oz. of bullion in storage in New York. There is also 22,801 oz. due from smelters and 56,634 oz. are contained in ore bagged at the mine. The company has $116,017 in cash.

A. I. M. E. Excursion Around San Francisco Bay

EDITORIAL CORRESPONDENCE

Cottrell and baghouse methods were demonstrated to the members of the American Institute of Mining Engineers that visited Selby, Calif., on Sept. 18. The visitors, including ladies of the party, numbered 198 and were guests of D. C. Jackling aboard his yacht "Cyprus." The A. I. M. E. convention at San Francisco closed on Sept. 17, and the following day was given over to various excursions, of which the yacht cruise was one of the most interesting.

The various points of interest in San Francisco Bay were visited before and after the stop at the smeltery. Just prior to the landing of the yacht at Selby, the dampers were opened and the smoke and fumes poured out of the stack in large and dense volumes, giving a very positive demonstration of the conditions that accompanied the smelting of ore several years ago, which conditions caused a great deal of complaint by farmers, resulting in the installation of the baghouse and the Cottrell system. Within a few minutes after the smoke had been allowed to escape, and at a given signal, the dampers were changed, throwing the smoke and fumes through the Cottrell and the baghouse, demonstrating clearly and practically to the visiting engineers a successful application of these methods of eliminating fume.

The courtesy of Mr. Jackling in placing his yacht at the disposal of the members of the Institute, and of Eugene Braden, manager of the smeltery, in providing the demonstration, was highly appreciated. The excursion gave the members and their ladies a delightful cruise on San Francisco Bay and showed them in a practical way that the control of smelting fumes not only can be, but has been, accomplished.

Chronology of Mining for September, 1915

Sept. 1—Price of silver went to 46¼c., the lowest on record.

Sept. 2—Crushing started in Nevada-Douglas mill.—Entire holdings of Tin Cup Gold Dredging Co. sold by the United States Court of Bankruptcy.

Sept. 10—Final decree of the Circuit Court filed at Trenton, N. J., dismissing suit against the United States Steel Corporation.

Sept. 11—Strike of miners at Clifton and Morneci, Ariz.

Sept. 14—Investigation of alleged zinc-smelting trust in Missouri started at Joplin.

Sept. 15—Holdings of Pittsburgh & Lake Angeline Co. sold to Cleveland-Cliffs Iron Co.

Sept. 17—Teck-Hughes taken over by Buffalo Mines.

Sept. 22—National Association of Mining and Stock Brokers organized at San Francisco.

Sept. 25—Old board of directors of Northport Smelting and Refining Co. resigned and new board elected.

Simple Cyanide-Plant Design

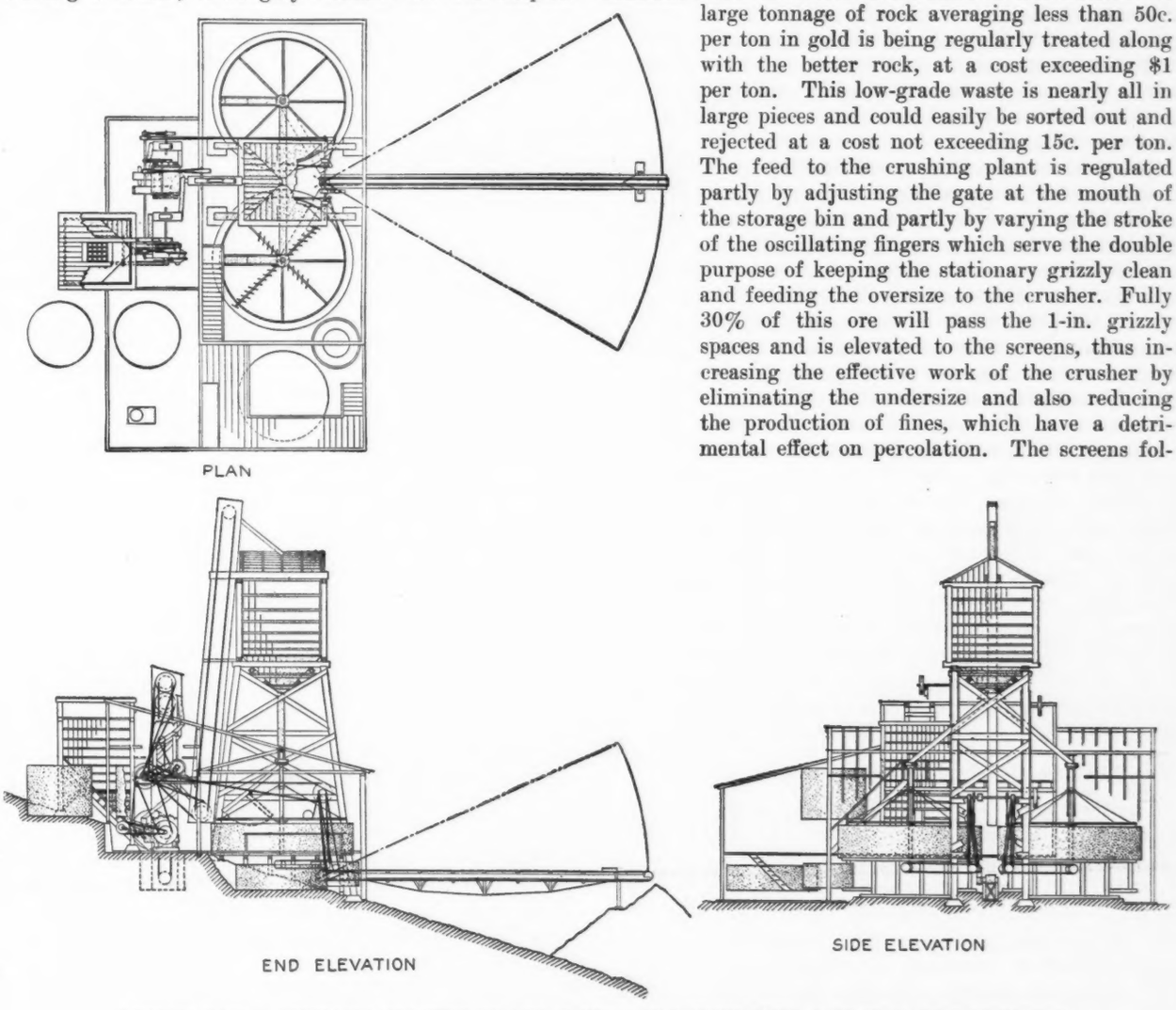
By S. A. Worcester*

SYNOPSIS—A highly oxidized ore, free from cyanicides, is treated by moderately coarse crushing and simple leaching. Automatic appliances and conveniences minimize labor and give maximum capacity. Limited space available for tailings is fully utilized. A new zinc-dust feeder and precipitator is used. Acid treatment of precipitates is eliminated.

This plant, which I recently designed for a local mine in which I am interested, has a capacity of 30 tons daily, treating a friable, thoroughly oxidized ore well-adapted to simple cyanidation. The mill, although small, is highly automatic and includes a number of simple and inexpensive devices which save labor and attendance and insure satisfactory and continuous operation. After passing the coarse grizzly above the 60-ton coarse-ore bin, the material is handled entirely by elevators, launders, excavators and conveyors, and all manual labor is avoided.

The ore, carrying about $4 per ton in gold, is dumped on the coarse grizzly either by the car from the mine or by the drag-bucket of the dump excavator. The attendant who delivers the ore breaks any oversize, and as about 99% of the ore will pass the grizzly without breaking, very little hammer work is necessary. Any coarse waste carrying less than $1 per ton is rejected at this point and sent to the waste dump.

Failure to eliminate coarse and entirely unprofitable waste from the material treated has been the cause of immense losses at several of the mills of this district. A large tonnage of rock averaging less than 50c. per ton in gold is being regularly treated along with the better rock, at a cost exceeding $1 per ton. This low-grade waste is nearly all in large pieces and could easily be sorted out and rejected at a cost not exceeding 15c. per ton. The feed to the crushing plant is regulated partly by adjusting the gate at the mouth of the storage bin and partly by varying the stroke of the oscillating fingers which serve the double purpose of keeping the stationary grizzly clean and feeding the oversize to the crusher. Fully 30% of this ore will pass the 1-in. grizzly spaces and is elevated to the screens, thus increasing the effective work of the crusher by eliminating the undersize and also reducing the production of fines, which have a detrimental effect on percolation. The screens following the crusher also eliminate undersize, sending it direct by elevator to the sand storage, this procedure having a beneficial effect on the work of the rolls, giving a more uniformly granular product and economizing power. The impact screen was chosen as the result of experience. It has great efficiency per foot of screen surface and space



DESIGN FOR A COMPACT CYANIDE PLANT USING BELT-CONVEYOR TAILINGS DISTRIBUTORS

*Mechanical engineer, Victor, Colo.

occupied. It requires little power, and repairs are quickly and easily made. The use of the 100-ton sand-storage bin, placed high enough to enable filling the leaching tanks through launders, not only gives storage, avoiding stoppage of the leaching plant in case of delay at mine or crushing plant, but also makes it possible to charge a 75-ton leaching tank—using the rotating distributor—and level the charge with the excavator in less than 30 min. A sliding gate combined with deflectors at the outlet of the sand bin controls and directs the flow of the sand to the distributors. It is operated by a lever having ropes reached conveniently from the ground floor.

Sand Distributor and Excavator

The excavator consists essentially of a four-arm plow, made of 2-in. pipe and equipped with sheet-steel blades, or rabbles, which resemble those used with circular mechanical roasting furnaces. This plow is rotated around the central 5-in. pipe column by a wheel 2 ft. less in diameter than the leaching tank. This wheel has arms and rim of 2-in. pipe, with small rods extending from the upper hub to the rim. Wooden blocks clamped on the rim in pairs about 12 in. apart constitute an interrupted groove for the driving rope.

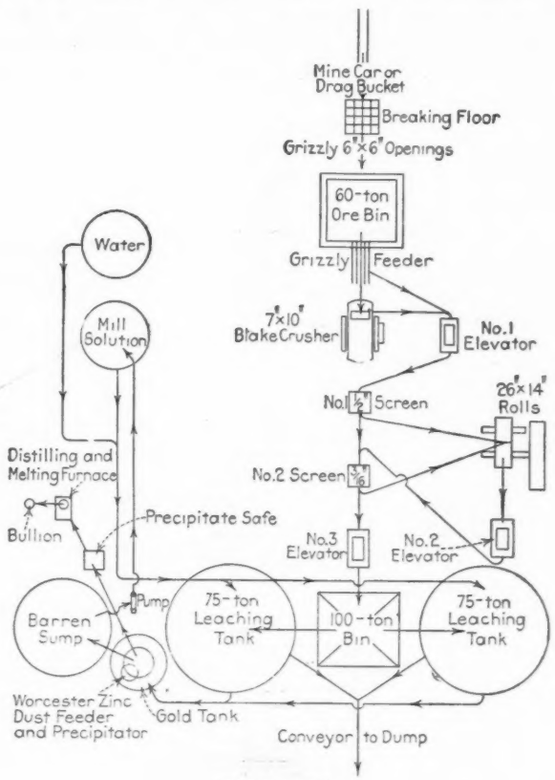
The rope is guided from the jackshaft which drives it to the plow wheel by one stationary sheave and one horizontally movable sheave, which is used as a tightener. When the tightener is relaxed and the plow stopped, the same movement throws a curved lifter between the sheave and the rope, taking the rope clear of the sheave and preventing rubbing. When charging a leaching tank the operator first puts the rope drive in action, using the tightener. He then opens the deflector gate, allowing 3 to 5 tons of sand per minute to flow from the sand bin to the distributing spout, which is mounted on the rotating plow wheel. The hinged end of the spout is then moved, a little at a time, toward the center of the tank as fast as it fills. The plow, hung up close to the wheel, smooths out the ridges and the charge is leveled as the tank is filled. The hinged spout is retained at any desired angle by a telescoping rod with a screw clamp. When excavating and discharging tailings the plow is lowered so as to rest its weight on the charge. A gate beneath the center column is opened and an opening punched through the sand. The plow and conveyors are put in motion, and the plow blades move the tailings to the center, where they drop through the gate to the short conveyor below.

Tailings Stack Formed by Conveyors

The short conveyors deliver to a long bridge conveyor which is pivoted and radially movable. This conveyor has radial movement both vertically and horizontally and covers a large dumping space before extension is necessary. Its outer end is supported by a ratchet jack of 5-ft. lift. When the tailings pile has grown so that the conveyor has been raised to the extreme angle at which sands will carry without running backward, the horizontal radial movement will begin, the jack being pinched along or around the arc on planks laid on flats dug in the tailings pile. An A-shaped tripper is made so that it can be clamped to the bridge at any point in its length. It scrapes the sands off equally on both sides of the belt. The sands are dry enough to pile with slopes of 38° from the horizontal. By occasionally moving the tripper and by radial movement of the conveyor both vertically and horizontally, any one of these operations requiring but a few minutes' time, the available dumping ground is fully utilized. The bridge conveyor is driven from the same jackshaft that drives the two short conveyors and the excavators. The belt tension and direction are easily and quickly adjusted by two movable idler pulleys which are set to suit any change of position of the bridge. The time required to discharge a 75-ton tank is about 2½ hr., so that but little time is lost in charging and discharging and the plant is kept up to capacity.

Usual Methods of Tailings Disposal

The almost invariable method of using tailings conveyors in this district has been to start with a stationary conveyor 25 to 40 ft. long on one or more high trestles and then patch on additional conveyor 10 or 20 ft. at a time,



FLOW SHEET

TREATMENT SCHEME FOR CYANIDE PLANT

building new trestles for each extension. The high trestles are expensive when built on solid ground, and when the usual short trestles are built on tailings heaps they settle irregularly and the conveyors run miserably. When one pile has reached the property line a new string of trestles and extensions is begun in another direction. Trippers are not used, and the one point of delivery is at the end of the conveyor. Patching an extension on the end of one of these conveyors on the top of a tailings heap in stormy, zero weather is a very undesirable job, and the contrivance is always getting out of order. The main drive has to be remodeled every time the direction of the conveyor is changed, and the conveyor is usually the worst nuisance around the plant.

On the other hand, the bridge conveyor here shown costs no more than a trestle conveyor of equal length, and it will pile to the limit all of the ground within its radial reach without any new construction or alter-

ations. A subsidence of a foot or two in the tailings stack will not affect the alignment or running of the conveyor, because it is self-contained.

Several of the local mills practice sluicing out tailings. In most cases water is expensive, the cost for one 125-ton plant exceeding $500 per month. Construction and maintenance of dams, etc., are costly, and to this is added annoying litigation brought by owners of property damaged by tailings. Much greater space is required to contain tailings in dams than is needed to pile them semi-dry at a steep angle. Sluicing demands constant attendance, whereas the excavator and conveyor system is automatic. The high-pressure stream necessary for effective sluicing damages filter bottoms, whereas the excavator has stops which absolutely prevent damage to the filter canvas.

Precipitation and Recovery of Gold

But one strength of solution is used with this low-grade ore. Time is saved in applying solution and wash water by having extra-large pipes for these purposes. A charge of sand is thus saturated with solution almost as fast as it is placed in the tank. Zinc dust is used for precipitation, which takes place in a circular, locked compartment in the gold tank. Precipitate is cleaned up daily, the operation requiring not more than five minutes. The zinc-dust feeder and precipitating apparatus are my invention.

When melting, the precipitates are charged semi-dry without acid treatment and with crucible and furnace cold. A crucible cover having a special condenser attached is used, and as the temperature rises the zinc is distilled early in the melting process.

Power for all purposes except precipitation is furnished by a 30-hp. three-phase 30-cycle G. E. induction motor of the old and heavy type. It will carry a 50% overload for indefinite periods. It drives the lineshaft with a short belt using—on the slack side of the belt—a swinging idler pulley, an arrangement which gives a large arc of belt contact with both pulleys without any unnecessary belt tension and requiring but little room and a short belt. The small amount of power required by the zinc-dust apparatus is supplied by the flow of solution.

Mineral Output of Sweden

The official report of Swedish mineral production shows the following: Iron ore, 6,586,630 metric tons; bituminous coal, 366,639; gold ore, 639; silver-lead ore, 3,100; molybdenite, 7; copper ore, 8,839; manganese ore, 3,643; zinc ore, 42,279; nickel ore, 156; pyrite, 33,313; feldspar, 20,818; quartz, 36,128; copper sulphate, 158; iron sulphate, 651; graphite, 56; powdered pyrolusite, 81 metric tons.

Owing to the war, the production of iron ore decreased about 11.9% from the figure of last year (7,475,571). Of the iron ore produced, 3,966,863 tons carried 60 to 70% Fe. There were 8,732 metric tons of ferrosilicon produced, 1,304 of ferromanganese-silicon, 1,300 of ferrochrome and 865 of all other ferro alloys. At Höganäs there were 6,394 metric tons of sponge-iron produced. Slig production was 620,591 metric tons.

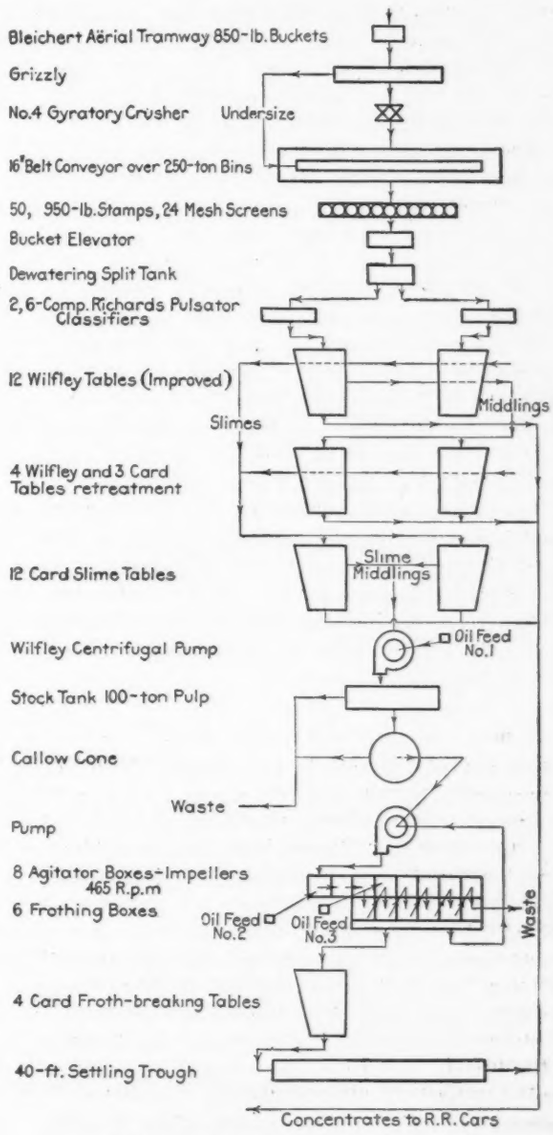
The metal production, excluding iron, was: Gold, 84 kg.; silver, 1.074; lead, 1,395,566; copper, 4,692,244, and zinc, 2,299,761 kg.

Concentrating Gold King Ores

By Warren C. Prosser*

The Gold King mine at Gladstone, San Juan County, Colo., has made a good production record, the total value of which is estimated to be in excess of $12,000,000. The property has suffered from continued heavy mill losses and high-grading.

The development early disclosed the valuable Gold King and Davis veins and has since opened many other profitable veins and stringers, together with irregular occurrences of free gold ore worth up to $15 per lb. These have proven a big factor in inducing sublessees to under-



FLOW SHEET, GOLD KING MILL

take the exploitation of various blocks of ground. A fault, which passes through the mine in a northerly direction, was explored several years ago, and the vein—containing some ore—opened beyond was called the Becker vein.

An irregular system of variable quartz stringers, separated by altered and decomposed horses of andesite, forms the orebody. It contains much iron pyrite, the greasiness

*Mining engineer, Silverton, Colo.

in appearance of which seems to indicate its value, in a measure. It contains variable amounts of lead and zinc sulphides which do not, however, constitute controlling factors in its mining and milling, except at infrequent intervals. The stringers are irregular in dip, being nearly vertical in the Davis and vicinity and flat in some instances near the Gold King, one vein being designated by its dip the "Flat Vein." In the Davis vein the free gold is usually associated with blende, while in the other veins it occurs more often with the iron pyrite and galena, and in both localities it is found in white quartz.

Nearly all of the work at present is confined to Nos. 2, 3 and 4 levels, and about 70 men are engaged in ore production.

The ore is mined by the lessees and sublessees and delivered to separate chutes passing down to No. 7 level, or the "American Tunnel," below. A vertical shaft connects Nos. 1 and 7 levels, and a cage with hoist in No. 1 level is used to handle men, tools, supplies, etc.

The operating lessees, who handle the tramway and mill and who are responsible for the management of the property, take the ore from the chutes on No. 7 level and bring it to surface by mule train, where it is dumped into the tramway-loading bin of 250 tons' capacity. It is there loaded by chutes into the tramway buckets of 850-lb. capacity and transported to the mill at Gladstone.

Here it passes through gyratory crusher and stamps and is concentrated on Wilfley tables and by a flotation scheme developed by Louis C. Bastian, the present mill superintendent, formerly with the American Smelting and Refining Co. in the same capacity, and construction superintendent of the Silver Lake mill near Silverton.

The experiments conducted by Mr. Bastian alone, resulting in the present successful operation, were begun a year ago in February and constitute the first successful treatment by flotation of San Juan County ores.

The accompanying flow sheet describes the general mill practice, which needs no special mention at this time outside of the flotation plant.

The Flotation Plant

The material treated in this plant is the middling and slimes product of the second retreatment tables. They are pumped into a square stock tank which has a capacity of 100 tons of pulp. Thence they pass to an 8-ft. Callow cone, the overflow from which joins the overflow of the stock tank, running to waste.

The thickened product is pumped to the first agitating compartment and passes through this and two other similar ones before it enters the first frothing compartment through a gate about 6 in. below the water level. Here it is skimmed by a revolving drag, and the underflow passes to the fourth agitating compartment and similarly diagonally through the five remaining frothing and four remaining agitating compartments. The underflow from the last frothing compartment runs to waste.

A cone plug regulates the flow of pulp from each frothing compartment and consequently the capacity of the plant. To maintain a uniform pulp level for successful skimming, Mr. Bastian has provided a 2-in. pipe, connected to the discharge pipe, which is fed from the lower strata in the frothing compartment by a surrounding 3-in. pipe, rising above the water and froth levels, which serves to hold back the froth. The concentrate froth discharged from the first three frothing compartments is sent over Wilfley and Card tables to aid in breaking it down and thence to a 40-ft. settling trough. Two tons of final concentrate are produced from each 30 tons of pulp handled.

Carbolic oil is fed to the pump used to hoist the pulp to the stock tank. Creosote oil is fed to the first compartment agitator, and pine oil is fed to the fourth compartment agitator, 300 c.c. of total oil per ton of pulp being used. No acid is found necessary. At the mine there is sufficient sulphuric acid in the mine water, the amount of which is not great, to destroy the air pipes and rails, which must be protected by splash boards, and it is probable that this preliminary treatment by nature renders further acid treatment unnecessary. For feeding the oil to the pulp Madison-Kipp No. 50 lubricators are used.

Experiments being conducted at present indicate that more of the mill products can be successfully treated through finer grinding, and plans now laid include the installation of Hardinge mills or the use of tube mills already installed but not used under the present system. Dorr thickeners will in all probability also be used.

The flotation and mill table concentrates run about the same, or in the neighborhood of $40 per ton. They contain in excess of 28% silica. The saving of metallic is said to be in excess of 85%.

Shannon Copper Co.

The quarterly report of the Shannon Copper Co., Metcalf, Ariz., for quarter ended June 30, 1915, shows a production of 2,867,000 lb. of copper, 320 oz. of gold and 16,100 oz. of silver. During this period 62,913 tons of ore was treated from the Shannon mine and 10,086 tons from the company's outside properties. The average price received for copper was 16.811c. in April, 18.506c. in May and 19.477c. in June. The average price received for the quarter was 18.398c. per lb. The net profits for the period were $164,648, of which $4,388 represented railroad earnings. The following table shows a comparison of operating costs for the quarter and for 1914:

	Quarter Ended June 30,1915	Year 1914
Mining cost per ton Shannon ore, including development	$1.74	$2.32
Concentrating cost per ton concentrated	.67	.85
Smelting cost per ton of burden	1.86	1.95
Converting cost per ton of fine copper	7.85	10.56

A plant of 150 tons' capacity for leaching the slimes and tailings will be constructed, and if this is operated successfully it will be increased to 500 or 600 tons' daily capacity. Quick assets amounted to $507,674 in excess of current liabilities at the end of the quarter.

Mineral Production of India in 1913

The following figures of mineral production in 1913 are given in *Records* of the Geological Survey of India, Vol. XLVI, 1915, the items being arranged in order of descending value: Coal, 16,208,009 long tons; gold, 595,761 oz.; manganese ore, 815,047 long tons; petroleum, 277,555,225 gal.; salt, 1,473,189 long tons; mica, 45,422 cwt.; saltpeter (exports, fiscal year 1912-13), 296,928 cwt.; tungsten ore, 1,688 long tons; lead ore and slag, 20,299 long tons; ruby, sapphire and spinel, 278,706 carats; tin ore and tin, 7,062 cwt.; monazite (value), £42,012; iron ore, 370,845 long tons; laterite, 292,985 long tons; silver, 125,209 oz.; copper ore, 3,810 long tons; steatite,

2,524 long tons; magnesite (crude), 14,086 long tons; alum, 7,742 cwt.; clay, 47,422 long tons; chromite, 5,676 long tons; corundum, 7,960 cwt.; diamonds, 116 carats; garnet, 334 cwt.; gypsum, 24,961 long tons; bauxite, 1,184 long tons; amber, 10 cwt.

These figures differ from those already issued by the Chief Inspector of Mines and given by the *Journal*. This is due to the fact that the inspector includes in his report only the production from those mines which come under the Indian Mine Act of 1901, while the figures just quoted give the complete returns collected from all sources.

Zinc Concentrates in the British Prize Courts

Several cases arising out of shipments of zinc concentrates from Australia, either captured or diverted to English ports as a result of the war, were heard by the President of the Probate, Divorce and Admiralty Division of the High Court during the week of Sept. 25, says the *Mining Journal*. In all there are five cases to be tried, involving something like £1,000,000. During the course of the hearing much important information as to the interrelation of various firms connected with the zinc industry was disclosed. The circumstances with regard to the various ships concerned vary.

Where the consignments were, on the face of them, to Aron Hirsch & Sohn, the property was condemned, but a lengthy argument was addressed to the Court, both on behalf of the Crown and on behalf of the firms concerned, with regard to parcels claimed by Henry R. Merton & Co., Vivian, Younger & Bond, the Australian Metal Co., and the Cie. des Minerais. The solicitor-general argued that the charterers were the Metallgesellschaft, and that the Australian Metal Co. and the Cie. des Minerais were its puppets. From the correspondence it was to be inferred that the Australian company purchased the concentrates on behalf of the Metallgesellschaft, which took entire control of the sale of the leady concentrates, and merely informed its English partners of what had been done. The so-called British firm, Henry R. Merton & Co., with its intimate German commitments and German origin, came to ask the court to help it to set up a partnership in a business mainly carried on in an enemy country.

Shipments Made Before War Broke Out

Maurice Hill, K.C., for the claimants, said this was no question of trading with the enemy, as it was concerned with shipments made before the war. The only question was as to the enemy or non-enemy character of the goods. The solicitor-general had referred to a German octopus which had spread its tentacles over the metal trade of the world, but it would be just as true and just as false to say that an English octopus had spread its tentacles over the German trade. Mr. Merton started the London business of Merton & Co. in 1860. He was born in Germany of English parents, and in 1899 or 1900 H. R. Merton & Co., Ltd., was formed. Mr. Merton had carried on business in England for 20 years before the Metallgesellschaft was formed in Germany. That was also a company in which Mr. Merton was interested, but to represent the whole concern as a German firm which was gradually, by means of subsidiary companies, getting its grasp on the metal trade of the world was wholly misleading. The majority of the shareholders in H. R. Merton & Co., Ltd., were English. Of the directors all except two were British. The Metallgesellschaft was formed in 1882, and the directors of H. R. Merton & Co. were the holders of a very large quantity of the shares. One shareholder, a Mr. Zuny, who died a short time back, by his will left the income on 300,000 shares to British charities.

The firm of Vivian, Younger & Bond was a partnership firm. At the beginning of the war two of the partners were British born, and the third, who afterward resigned, was a naturalized British subject. As to the Australian Metal Co., the shareholders in the majority were German—26,700 out of 50,000. The directors also at the beginning of the war were in the majority Germans—four against three. The Cie. des Minerais was formed in 1900, and of its shareholders about 60% were German and the rest mainly Belgian and French. As to the Ore Trading Co., which came into the matter as merchants for dealing with certain ore on behalf of all these companies and firms, the large majority of the shareholders were British, American and German. Mr. Hill submitted that the evidence showed that the property in the zinc concentrates in question was in the Cie. des Minerais, and the property in the leady concentrates was jointly in the Metallgesellschaft, H. R. Merton & Co., Vivian, Younger & Bond, and the Australian Metal Co. Therefore, applying the test of property, the proper order to make was to release the zinc concentrates altogether and to release the leady concentrates as to three-fourths and to condemn it as to one-fourth—the fourth share belonging to the Metallgesellschaft.

Belgian Testimony Unfavorable to Defendants

At this point the solicitor-general interposed, as a witness as to the constitution of the Cie. des Minerais, J. C. Van der Taelen, a Belgian, managing a leading Belgian metal company in Antwerp, but at present connected with Peters & Co., of London. He stated that the company did not smelt or work the zinc, but sold the ore to the smelters and bought back the metal produced. So far as he knew, most of the directors were associated with the Metallgesellschaft and the company was practically German.

In the course of cross-examination, W. M. Wilson, a director of Henry R. Merton & Co., stated that his firm acted as bankers for the Australian Metal Co. and the Cie. des Minerais and that the Gesellschaft supplied them with money to meet these charges. Since the war they had received no remittances from the Continent, and he feared at the end of the war it would be impossible for Germany to remit in full, if at all.

Further hearing was adjourned.

Utah Apex Quarterly Report

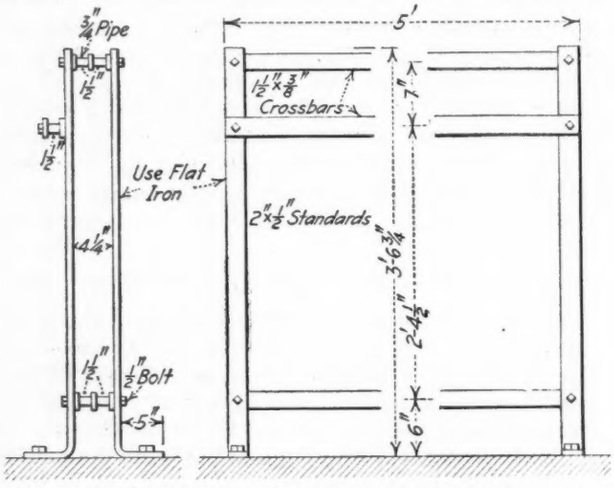
The report of the Utah Apex Mining Co., Bingham, Utah, for the quarter ended June 30, 1915, shows net earnings of $72,154. Gross receipts were $233,822; mining expenses, $118,980; development, $38,214; and accrued bond interest and all other expenses, $4,474. The company had about $200,000 cash on hand. A dividend of 12.5c. a share was declared payable on Oct. 1. Out of an original bond issue of $350,000 all bonds but $36,000 have been retired, and the treasurer is prepared to purchase these bonds at par and accrued interest.

Details of Practical Mining

Blacksmith-Shop Tool Rack

By D. E. Charlton*

At mine blacksmith shops, where the space is small and it is necessary to keep the floor clear of tools, the rack illustrated has proved satisfactory. The construction is simple. The contrivance consists essentially of four standards, the lower ends of which are turned over, as shown in the sketch, to form a means of fastening the rack to a base, and six crossbars 5 ft. long, made of 1½x⅜-in. flat iron held to the standards by means of ½-in. bolts. The standards are made of 2x½-in. flat iron, each 3 ft. 11¾ in. long. Between the crossbars are placed 1½-in. lengths of ¾-in. pipe, to make the



TOOL RACK FOR BLACKSMITH SHOP

spaces in which the tools are placed. The upper spaces can be used for hammers, the outside one farther down for tongs and the lower ones for swages. The length of the rack may be increased or decreased. If it is desired to lengthen it, an additional set of standards should be placed half-way between the end standards. The rack is bolted to a base on a level with the floor.

Angove Skip-Dumping System

In the Copper Range mines the filling system makes necessary the dumping of poor rock at various levels. The Angove system of dumping is employed, pockets being attached beneath the skipway to receive the rock and lead it into chutes. Naturally, if the strain on the skip rope at this point continued, should the engineer happen to hoist his skip too far, the skip would keep on turning and instead of dumping its rock into the pocket would dump it back down the shaft, endangering life as well as the operation of the shaft. Angove has forestalled this possibility by a very simple device.

At each of the dumping stations he has placed a hinged bar across the skipway, high enough to clear the skip in its ordinary passage. But when the dumping device is in place at any of these points the engineer cannot now hoist his skip too far because if he does so the rear of the skip will strike this bar and will be prevented from rising. The continuing strain on the rope will pull the skip through, and it will go up the shaft in its natural position.

The device has greatly facilitated the dumping of poor rock in the Copper Range mines. It is in line with the "safety-first" principle, as well as that of efficiency.

*Mining engineer, Virginia, Minn.

A Serviceable Coal Chart

In its report to the National District Heating Association at Chicago, June 1-3, the Station Operating Committee incorporated the accompanying coal chart.

From the proximate analysis of the coals given the chart may be used to determine the cost of steam per 1,000 lb. with various grades of coal at prices ranging from $8 to 25c. per ton and the evaporation to expect. Take, for example, Duquoin (Ill.), coal. The analysis shows that this has 82% combustible; the remaining 18% is ash, moisture and other noncombustible materials. The analysis at the right of the table also shows that this coal has 47½% of fixed carbon and 34½% volatile matter.

Referring to the left-hand side of the chart at the top, under "Percentage of Combustible in Coal" find the dotted line starting at 82. Follow this line down until a point on the vertical scale is reached reading 47½, which is the fixed carbon in the coal. Then by reading the slanting line to the left, it is found that there is 58% of fixed carbon in the combustible. From here the dotted line reaches the point 58 at the top of the chart and then passes down to the heavy line "Efficient B.t.u." Then by reading to the left it is found that a pound of combustible should contain about 9,200 B.t.u. As this coal has only 82% combustible, the line sloping downward is followed until it intersects the 82% on the horizontal scale. Then by reading to the right it is found that the evaporation should be about 7.8 lb. of water per pound of coal. Follow this line on through to the $2 line in the center diagram of the chart, and the price of the coal in the bin is found. From the intersection read down to the bottom of the center diagram, which shows that the coal would cost 14½c. per 1,000 lb. of steam.

At the top of the center diagram the evaporation factors have been graphically displayed. Assuming that water at 62 deg. F. is evaporated into steam at 150 lb. pressure and no superheat, it will be found by reading to the right from 62 to the slanting line representing 150 lb. that the evaporation factor is 120%; consequently the cost of steam per 1,000 lb. will be increased 20%. The steam would then cost approximately 17½c. per 1,000 lb.

This chart is based on high-class operation. The top curve on the left-hand chart is based upon Dulong's formula for figuring the B.t.u. in the combustible. The

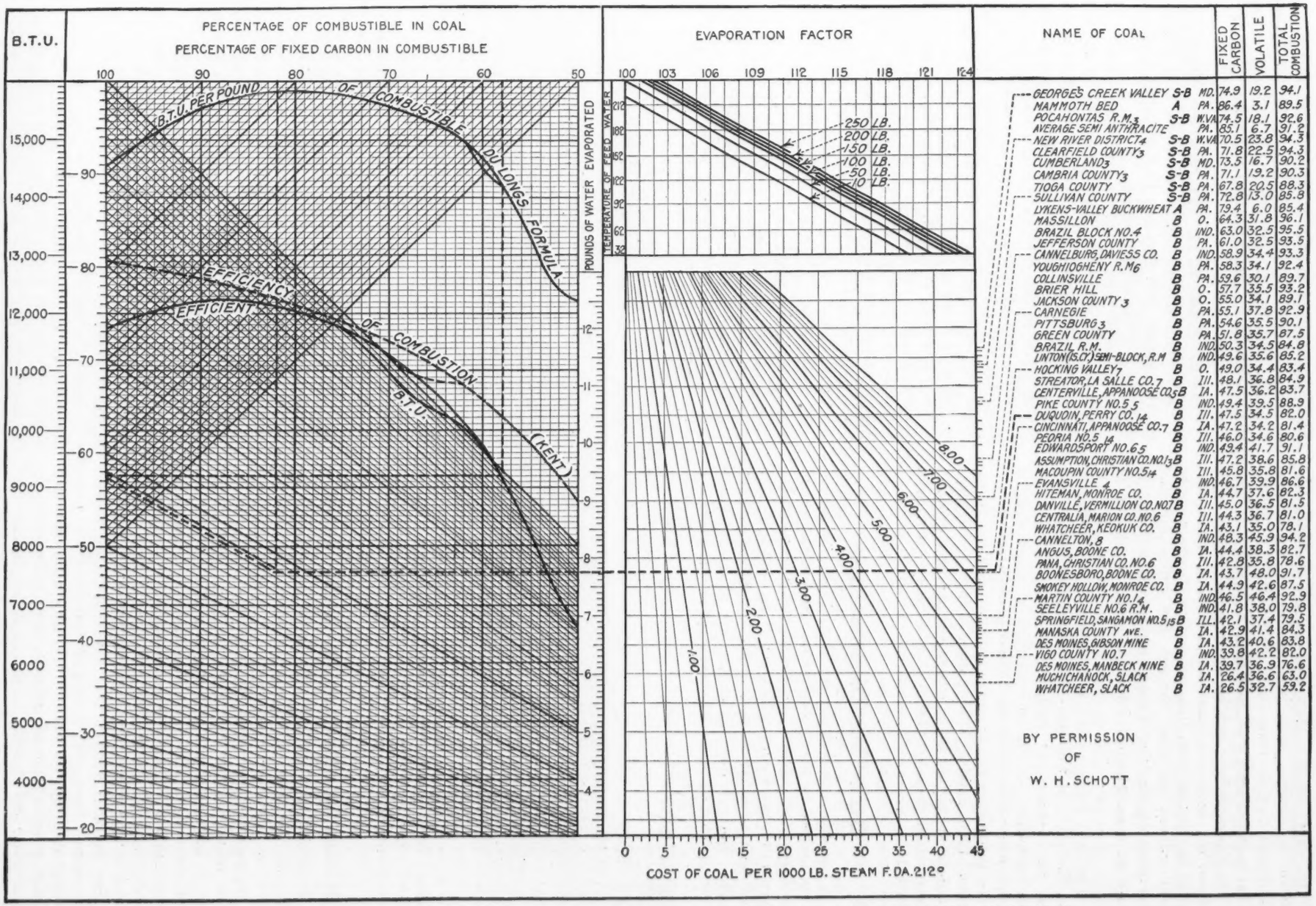

B.T.U.
PERCENTAGE OF COMBUSTIBLE IN COAL
PERCENTAGE OF FIXED CARBON IN COMBUSTIBLE
100 90 80 70 60 50
B.T.U. PER POUND OF COMBUSTIBLE
DULONG'S FORMULA
EFFICIENCY
EFFICIENT
OF COMBUSTION
B.T.U.
(KENT)
15,000 14,000 13,000 12,000 11,000 10,000 9000 8000 7000 6000 5000 4000
90 80 70 60 50 40 30 20
POUNDS OF WATER EVAPORATED
TEMPERATURE OF FEED WATER
212 182 152 122 92 62 32
12 11 10 9 8 7 6 5 4
EVAPORATION FACTOR
100 103 106 109 112 115 118 121 124
250 LB.
200 LB.
150 LB.
100 LB.
50 LB.
10 LB.
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0 5 10 15 20 25 30 35 40 45
COST OF COAL PER 1000 LB. STEAM F. DA. 212°
NAME OF COAL
FIXED CARBON
VOLATILE
TOTAL COMBUSTION
GEORGES CREEK VALLEY S-B MD. 74.9 19.2 94.1
MAMMOTH BED A PA. 86.4 3.1 89.5
POCAHONTAS R.M.2 S-B W.VA 74.5 18.1 92.6
AVERAGE SEMI ANTHRACITE PA. 85.1 6.7 91.2
NEW RIVER DISTRICT4 S-B W.VA 70.5 23.8 94.3
CLEARFIELD COUNTY3 S-B PA. 71.8 22.5 94.3
CUMBERLAND3 S-B MD. 73.5 16.7 90.2
CAMBRIA COUNTY3 S-B PA. 71.1 19.2 90.3
TIOGA COUNTY S-B PA. 67.8 20.5 88.3
SULLIVAN COUNTY S-B PA. 72.8 13.0 85.8
LYKENS-VALLEY BUCKWHEAT A PA. 79.4 6.0 85.4
MASSILLON B O. 64.3 31.8 96.1
BRAZIL BLOCK NO.4 B IND. 63.0 32.5 95.5
JEFFERSON COUNTY B PA. 61.0 32.5 93.5
CANNELBURG, DAVIESS CO. B IND. 58.9 34.4 93.3
YOUGHIOGHENY R.M6 B PA. 58.3 34.1 92.4
COLLINSVILLE B PA. 59.6 30.1 89.7
BRIER HILL B O. 57.7 35.5 93.2
JACKSON COUNTY 3 B O. 55.0 34.1 89.1
CARNEGIE B PA. 55.1 37.8 92.9
PITTSBURG 3 B PA. 54.6 35.5 90.1
GREEN COUNTY B PA. 51.8 35.7 87.5
BRAZIL R.M. B IND. 50.3 34.5 84.8
LINTON(S.CY.) SEMI-BLOCK, R.M B IND. 49.6 35.6 85.2
HOCKING VALLEY7 B O. 49.0 34.4 83.4
STREATOR, LA SALLE CO.7 B III. 48.1 36.8 84.9
CENTERVILLE, APPANOOSE CO.5 B IA. 47.5 36.2 83.7
PIKE COUNTY NO.5 5 B IND. 49.4 39.5 88.9
DUQUOIN, PERRY CO. 14 B III. 47.5 34.5 82.0
CINCINNATI, APPANOOSE CO.7 B IA. 47.2 34.2 81.4
PEORIA NO.5 14 B III. 46.0 34.6 80.6
EDWARDSPORT NO.6 5 B IND. 49.4 41.7 91.1
ASSUMPTION, CHRISTIAN CO.NO.13 B III. 47.2 38.6 85.8
MACOUPIN COUNTY NO.5 14 B III. 45.8 35.8 81.6
EVANSVILLE 4 B IND. 46.7 39.9 86.6
HITEMAN, MONROE CO. B IA. 44.7 37.6 82.3
DANVILLE, VERMILLION CO.NO.7 B III. 45.0 36.5 81.5
CENTRALIA, MARION CO.NO.6 B III. 44.3 36.7 81.0
WHATCHEER, KEOKUK CO. B IA. 43.1 35.0 78.1
CANNELTON, 8 B IND. 48.3 45.9 94.2
ANGUS, BOONE CO. B IA. 44.4 38.3 82.7
PANA, CHRISTIAN CO. NO.6 B III. 42.8 35.8 78.6
BOONESBORO, BOONE CO. B IA. 43.7 48.0 91.7
SMOKEY HOLLOW, MONROE CO. B IA. 44.9 42.6 87.5
MARTIN COUNTY NO.14 B IND. 46.5 46.4 92.9
SEELEYVILLE NO.6 R.M. B IND. 41.8 38.0 79.8
SPRINGFIELD, SANGAMON NO.5 15 B ILL. 42.1 37.4 79.5
MANASKA COUNTY AVE. B IA. 42.9 41.4 84.3
DES MOINES, GIBSON MINE B IA. 43.2 40.6 83.8
VIGO COUNTY NO.7 B IND. 39.8 42.2 82.0
DES MOINES, MANBECK MINE B IA. 39.7 36.9 76.6
MUCHICHANOCK, SLACK B IA. 26.4 36.6 63.0
WHATCHEER, SLACK B IA. 26.5 32.7 59.2
BY PERMISSION
OF
W. H. SCHOTT

CHART SHOWING THE COST OF STEAM FROM A GIVEN GRADE OF COAL UNDER VARIOUS CONDITIONS

dotted curve on this same chart is the efficiency that should be obtained when burning the coal under good conditions, and the lower curve, "Efficient B.t.u.," shows what to expect from good operation.

On the right-hand side of the diagram various kinds of coal are shown and lines point to the evaporation that could be expected from this coal, so that the chart can be used without following through the entire diagram. For example, Hocking Valley (Ohio) coal is shown to have an evaporation of 8.1 lb. of water per pound of coal.

The basis for this chart was loaned the committee by W. H. Schott, of Chicago. The evaporation factors and the cost of steam per 1,000 lb. have been worked up by the committee. It will be interesting to notice that the curve shows nicely that the highest thermo-value occurs when the volatile matter in the combustible is somewhere around 20%, ranging possibly from 16 to 24; or in other words, in the highest thermo-value coal the fixed carbon in the combustible ranges from 76 to 84%.—*Power,* Sept. 28, 1915.

Box-Car Dimensions

A proposed standard box car of steel construction has been designed by the Committee on Car Construction of the Master Car Builders' Association and was reported at the annual convention at Atlantic City for criticism. The cubic volume of the car body under the carlines is 3,096 cu.ft. The principal dimensions are as given in the accompanying table, taken from *Engineering News.*

	Ft.	In.
Length of frame over striking casting	42	6
Width over sheathing	9	1⅛
Length, inside	40	6¼
Width, inside	8	6
Height, inside	9	0
Height, from rail to bottom of bolster	2	6
Height, from rail to floor	3	8½
Height, from rail to top of running board	13	4½
Height, from rail to top of brake staff	14	2
Width, at eaves	9	2⅛
Height, at eaves	12	5¼

Ore-Loading Rate on the Gogebic Range

At the Colby mine a 70-ton Bucyrus shovel loaded 150 cars, a total of 6,615 tons, of ore from stockpile in 10 hr. Later at the Newport mine a 70-C Bucyrus shovel loaded 162 cars, a total of 8,094 tons, of ore in 10 hr.—*The Excavating Engineer,* Aug., 1915.

Mine Accidents in New York

There were 41 mines and 135 quarries operated in the State of New York during the year 1914, according to the report of the state mine inspector. A steady decrease in fatality rate per thousand employed per annum in these mines is noted during the last three years—from 6.27 in 1912 to 5.6 in 1913 and to 3.77 in 1914. The total number of men employed in mines was 3,033, of whom 1,855 were employed in iron mines; the quarries employed 4,855, making the total number employed in mines and quarries in the state for the year 7,888.

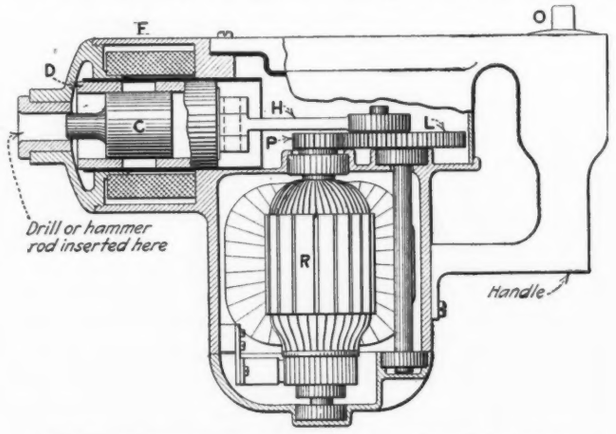
The limestone quarries were the largest employers of this class of labor, with a total of 2,607 men; the iron-mining industry was next, with 1,855; sandstone and granite quarries followed, with 584 and 554 respectively; the gypsum and rock-salt mines employed 378 and 376 respectively; bluestone quarries employed 267; the balance of the total was divided variously among the pyrites, graphite, garnet, talc, natural-cement and zinc mines, and marble, slate, spar, shale, trap and millstone quarries.

New Electric Hammer Drill

The Western Electric Co. has placed on the market an electric hammer drill that may be operated at small cost from any convenient light-socket.

The principle upon which this hammer works is as simple as it is effective. The main parts of the machine are the motor, a drill or hammer, and the magnetic clutch plunger. The motor *R* in the accompanying drawing transmits motion through the hardened gears *P* and *L* and the connecting-rod *H* to the cylindrical sleeve *D,* which has two relatively thick end sections with a thin center section connecting them. This center section is as thin as is consistent with mechanical strength.

The plunger *C,* which delivers the blow to the drill, lies loosely within this cylinder and is not mechanically connected to it or to any other part of the mechanism. Outside of the sleeve is placed the magnet coil *F.* This coil is stationary, the sleeve moving backward and forward within it. The coil is in series with the motor, and the current traversing it is always steady and in the same direction.



CROSS-SECTION OF THE DRILL, SHOWING THE ARRANGEMENT OF PARTS

As soon as the circuit is switched on (by the button *O* conveniently arranged on the handle) a magnetic circuit is created with the thick sections of the sleeve as the poles and the plunger as the armature. As the sleeve is oscillated back and forth by the motor, the effect is that of moving the polepieces of the magnet back and forth, and the plunger clutched across the poles moves similarly, transferring its energy to the drill when the two parts come in contact, which takes place near the end of the stroke. The plunger is slightly longer than the thin section of the sleeve, which gives it a certain amount of overtravel and an elasticity of connection that entirely remove the stress and jar of the blow from the machine.

The motor is series-wound and the gears are of oil-hardened special gear steel, while ball bearings are employed throughout.

A number of these drills have for some time been in successful use in coal mines, where they have been employed not only for taking down top and lifting bottom, but also for drilling the coal face preparatory to shooting.

Details of Milling and Smelting

Intermittent Discharge on Dorr Thickener

At the plant of the Bunker Hill & Sullivan Mining and Concentrating Co., at Kellogg, Idaho, the equipment includes several 40x12-ft. Dorr thickeners. Since some difficulty has been encountered through the plugging and stopping of the discharge pipe, due to thick pulp and the introduction of some foreign material, it was thought better greatly to increase the size of this pipe. To do this, however, without providing some means of reducing the quantity of material discharged would have been calamitous.

The difficulty was solved by providing a simple intermittent discharge from the delivery pipe. The pipe was carried from the center of the bottom of the tank to the outside, and there an equipment similar to an ordinary gate valve with a long stem was provided. The stem of this valve was connected to an eccentric taken from a worn-out jig and so arranged that the throw of the eccentric opened and closed the valve. The arrangement is perfectly simple and accomplishes the desired result without any trouble. Of course the size of the discharge pipe and the number of openings of the valve per minute can be arranged to suit any local requirements. The speed of opening and closing may be anything between 15 and 25 per min.

Vanadium in Nonferrous Alloys

In a paper read before the Atlantic City convention of the American Institute of Metals, on alumino-vanadium, W. W. Clark reaches the following conclusions:

"It is doubtful whether small amounts of vanadium will increase the tensile strength of nonferrous metals beyond that due to its powerful deoxidizing properties. Vanadium is a scavenger which unites with the oxygen in the metals and, as claimed by some investigators, the nitrogen. It, however, should not be used as a scavenger, as there are a number of as good and cheaper ones available. If one of these is used to cleanse the metal before adding the vanadium, the latter is retained and its full alloying effect is available. Vanadium in small amounts does increase the elongation, and I have no doubt that if it were produced and sold at a price that would make it available it would come into general use."

Old Car Wheels for Sheaves

By Jesse Simmons*

Old car wheels make excellent sheaves and carriers for haulage ropes, according to Edward Manion, superintendent of the Wasp No. 2 property, Flatiron, S. D. At this property two old wheels are bolted together with three bolts, with the flanges on the outside. The old axles may be used for shafts. When used as sheaves, as in Fig. 1, the shaft is provided with a single collar at the bottom and extends downward into the foundation timber—usually a 2x8—and upward into a wooden support. When used as carriers, as in Fig. 2, they give equally satisfactory service.

FIG. 1. OLD CAR WHEELS AS SHEAVES

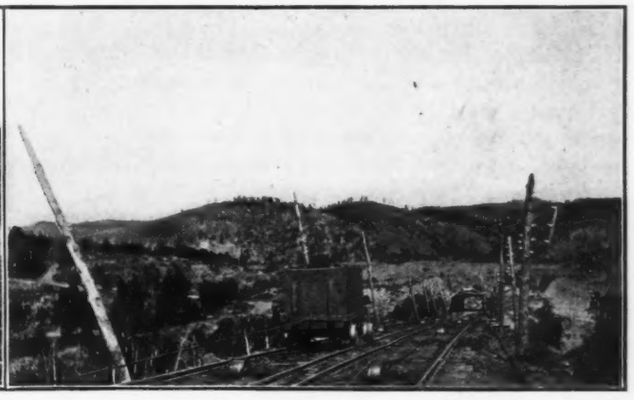


FIG. 2. OLD WHEELS AS CARRIERS

The chilled treads of the wheels form ideal surfaces for the rope to travel on and are much harder and more durable than the carriers and sheaves ordinarily sold for this purpose. As any mine has at all times a more or less liberal supply of old car wheels and axles, it may never want for carriers and sheaves if this plan is followed.

Zirconium-Iron Alloys

According to John L. Brown, of Baltimore, Md., alloys of zirconium and iron can readily be produced by the reduction of a mixture of the oxides of the two metals (U. S. Pat. 1,151,160, assigned to Edward R. Cooper, of Baltimore, Md.). Especially is this reaction easily carried on in the presence of a little titanium oxide, which is likewise reduced, the titanium giving valuable qualities to the product. The reduction may be carried on by aluminum, or by carbon in an electrically heated

*Deadwood, S. D.

crucible or in a crucible heated by the oxyacetylene flame. The alloys are said to be particularly valuable as filaments for electric lights. Those covered by the patent contain not less than 40% or over 90% of zirconium.

Failure of Structural Brasses*

In an investigation of the season-cracking of brass, by P. D. Merica and R. W. Woodward, the following conclusions were reached:

Season-cracking and similar failures occur in brass materials that are under initial stress, provided these stresses average over 5,000 to 6,000 lb. per sq.in.

These stresses may be almost entirely removed by annealing at temperatures of about 300° C. to 400° C., which temperatures do not affect sensibly the ordinary physical properties.

No certain indication of the magnitude or even presence of such stresses has so far been found in a study of (a) the action of etching agents such as $HgNO_3$ or NH_4OH on brass, or (b) the micro- or macro-structure.

Brass may be manufactured practically free from stresses, and still retain excellent mechanical properties; that is, be not too soft.

Thus it would seem that from the standpoint of the user of brass further investigation should continue to correlate the service behavior of brasses with their physical properties and initial stresses so that it may finally be possible to decide what are the magnitude and the distribution of initial stresses which are allowable in such materials. Further, the most convenient method of measuring or obtaining an indication of the value of these stresses should be sought. At present this is the elongation method, which is a fairly tedious one.

From the standpoint of the manufacturer, investigation should concern the influence of the mode of manufacture on the initial stresses, the influence of other chemical elements in producing hot or cold shortness and a study of the best manner of annealing such materials. To anneal brass at 300° to 400° is not convenient with the ordinary brass-rolling mill equipment, and it is possible that some higher temperature might be used without softening the material unduly.

Sampling Lead Bullion at the El Paso Smelting Works

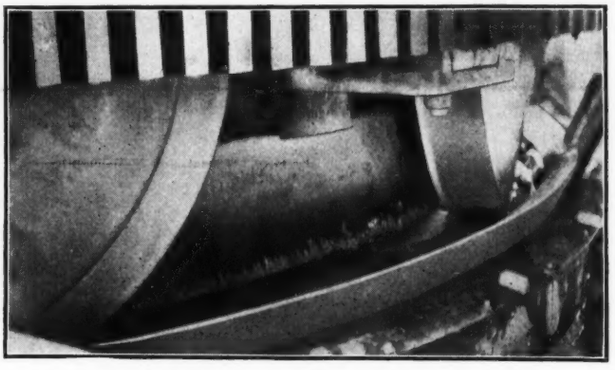
In discussing the lead-smelting practice at the El Paso Smelting Works, El Paso, Texas, H. F. Easter describes[1] the sampling of the base bullion as follows:

Whether drossed at the blast furnace or at the remelting furnace, the bullion is tapped into a cast-iron cooling pot. The dross is skimmed off carefully and thoroughly. Before the final skimming the contents of the kettle are well stirred and the dross thereby raised is taken off completely. After skimming, the contents of the cooler are stirred again and, while the lead is still in motion, gum-drop samples are dipped. A few more gum drops are taken than it is expected to make into bars of lead, to insure having a gum drop for each bar of lead.

The bullion is ladled into molds, and after the pot is empty all extra gum drops over the number of bars produced are thrown out. These gum drops are held and delivered to the assay office whenever the bullion corresponding to them is removed. A shipping lot consists of 780 bars (about 42 tons), and, when complete, the 780 gum drops corresponding are placed in a graphite crucible and melted at as low a temperature as will give a homogeneous mass from which to dip the final gum-drop samples, upon which the actual assay of the lot is made. Great care is taken not to get the sample hot enough to oxidize the lead during the process. The gum drops, which weigh about 40 grams each, are assayed without clipping and the gold and silver calculated to an assay-ton basis.

Amalgamating in a Lane Mill

The accompanying photograph shows the condition of the inside of a Lane slow-speed chilean mill in which amalgamation is taking place. The clustering of the amalgam to the ring and close to the roller shows that the agitation, even at that point, is not severe enough to



AMALGAM IN 10-FT. LANE MILL

The overflow is removed ready to clean up. The amalgam builds up as an inner mud ring

scour the amalgam off and indicates extremely favorable conditions. This installation is at the McCausland plant, Death Valley, Calif., where mills of this type have proved satisfactory in all respects.

Bacon's Precipitation Method for Copper Solutions

A cyclic process for the recovery of copper from copper-leaching operations has been patented by Raymond F. Bacon, of Pittsburgh, Penn., assignor to Metals Research Co., of New York (U. S. Pat. 1,151,234). In this process, the solutions from the leaching operations are treated with hydrogen sulphide, producing cupric sulphide and regenerating the solution for further leaching operations. The cupric sulphide, together with a quantity of elemental sulphur equal to one-half its sulphur contents is then treated in a still with hydrocarbon gases which convert the elemental sulphur and one-half the sulphur in the cupric sulphide to hydrogen sulphide. This may then be used as a precipitant.

The production of the elemental sulphur is covered by U. S. Pat. 1,151,236, sulphur dioxide from roasting the ores preparatory to leaching being mixed with the hydrogen sulphide produced as specified above, water and sulphur being formed. This action goes on either in the mixed gases, or when they are in solution.

Magnalium Turnings Should Be Melted by forcing them down into a pool of the molten metal, according to John Coulson, at the Institute of Metals meeting.

*From a paper presented before the Atlantic City meeting of the American Institute of Metals, September, 1915.

[1]Excerpt from a paper entitled "Lead Smelting at El Paso," presented at the San Francisco meeting of the American Institute of Mining Engineers, September, 1915.

Mining & Metallurgical Machinery

Wright Concentrating Table

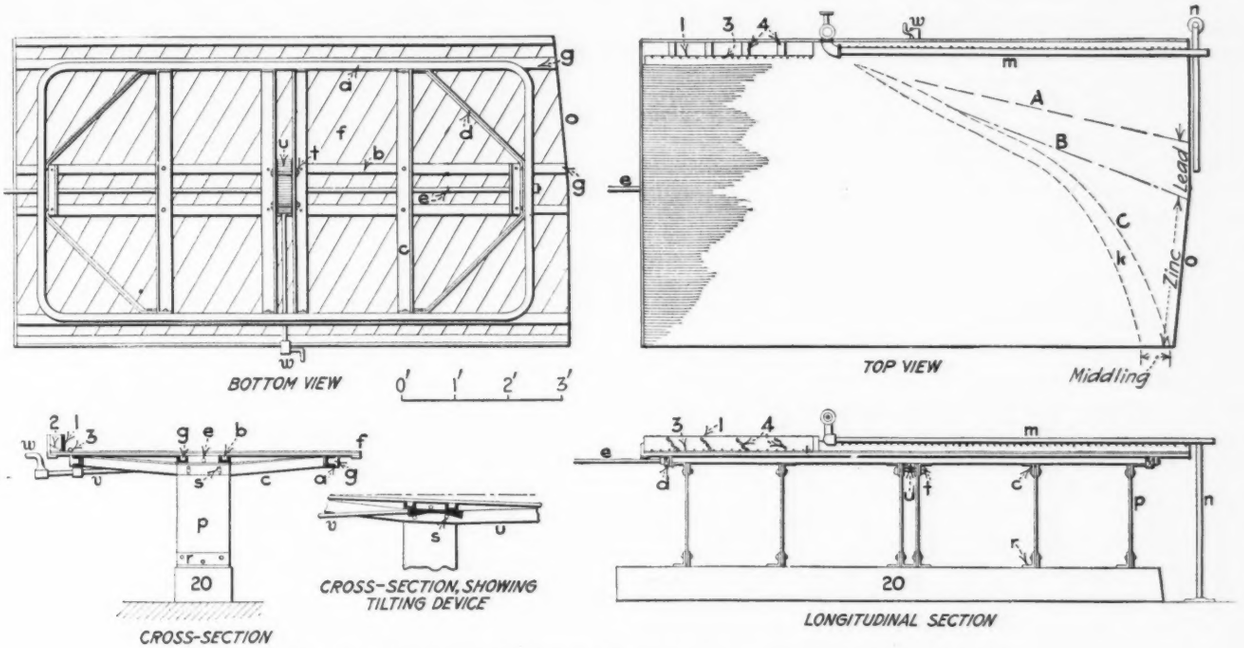
By C. W. Wright*

Table treatment of crushed ore is a simple process and one that requires a simple machine to secure best results. Most manufacturers of milling machinery make a type of table with some special improvement not found on others. There are tables of various shapes with many forms of grooves and riffles, and some tables having doubly inclined surfaces that attempt to treat an unclassified feed of sands and slimes on the same deck. Often several different types of tables may be seen in the same mill, especially when the millman has been anxious to have the best. They all do good work if run properly. It is more often the fault of the mill foreman than of the table if good results are not obtained. In many mills the tables have little chance to do efficient work because of the criminal amount of water in their feed. This is often due to the mill design, which does not allow sufficient grades for the launders, making necessary the use of an excessive amount of water.

The type of table to be described is one which we have had in use in Sardinia in some of our lead-zinc mills for four years. All of our mills are equipped with them, a total of about 60 being in use. Six years ago there were no tables used and the streams below the mills were sparkling with galena. It was not a pleasing sight, and I found it necessary to design and build tables on the ground. The machines have been modified somewhat each year, and the final result is the one now in use.

*Mining engineer, Ingurtosu, Sardinia, Italy.

The details of construction are shown in the accompanying drawings. The rectangular frame *a* is made of channel iron 60 mm. high by 40 mm. wide, and two longitudinal channels *b*. Small angle irons *d* placed diagonally across each corner are bolted to the frame to give rigidity. Large angle irons *c* constitute the transverse members of the frame, and to these the supports and tilting device are attached. An iron rod, or bolt, *e* passes longitudinally through the center of the frame, serving to clamp the entire frame rigidly together. The end of this rod extends beyond the end of the table and to it the head motion is attached. This central longitudinal member is important, as it distributes the pull of the head motion over the entire length of the table and also acts as a pivot for tilting the table on its supports. The table top *f* is made of 1-in. boards spaced $^1/_{12}$ in. apart to allow for swelling. These are screwed to four longitudinal stringers *g* of pitch pine which are bolted to the channels. There are six flexible supports *p* 30 cm. wide for the table with notches at the top in which the central rod rests. These supports are bolted to the transverse angle irons *c* of the frame and to angle-iron plates *r* bolted to the foundation beam 20.



DETAILS OF CONSTRUCTION OF THE WRIGHT CONCENTRATING TABLE

Head Motion and Feed

On the first tables built a simple eccentric head motion was used in conjunction with the flexible supports, which were inclined so as to impart a throwing motion to the table, this being the patented principle of the Ferraris table. Tables with this motion give satisfactory results, especially in the treatment of sands. Later we adopted

the Wilfley No. 5 head motion in conjunction with vertical supports, and these gave better results in the treatment of the slimes. Any type of head motion may be used.

The feed trough consists of a band of sheet iron 1 bent to form the front and side of the trough, which is about 1 m. long and 8 cm. wide. The back of the trough is the backboard of the table, and the bottom of the trough is the surface of the table which, however, within this inclosure, is raised toward the back by the insertion of a wedge-shaped strip of wood 2 under the linoleum. The distribution of the feed onto the table is through a row of small holes 3 at or near the bottom of front side of the trough. To check the flow of the water in the feed as it enters the trough and to cause a classification of the material in the feed, several small screens 4 are secured in the trough perpendicular to the sides. The best results are obtained when the tops of these screens are inclined toward the feed entrance. From this type of feed trough the coarse ore is discharged through holes nearest the head of the table and the slimes nearest the concentrate end. Wash water is supplied through the pipe *m*, and *n* is a stanchion to support it.

The Arrangement of the Riffles

As to the riffles, the arrangement used on the Wilfley tables with diagonal line of termination was first tried, the riffles being high at feed and tapering to 0 toward the concentrate end. This height was gradually cut down and the spacing reduced. The present size of riffle is 3 to 4 mm. in height, 6 mm. in width and spaced 15 to 20 mm. c. to c. and tapered only near the ends. With the diagonal termination of the riffles it was found that the middlings, which are usually coarser than the concentrates, discharged onto the smooth surface of the table at the ends of the riffles and formed a narrow diagonal band, dragging along under them in their downward course a portion of the concentrates. At the point of division where the concentrates and middlings discharge from the table, the separation was not distinct and the result was that some middlings would go with the concentrates and some concentrates with the middlings.

Ending the riffles or grooves so that their termination points on the upper half of the table form a diagonal line and those on the lower half form a curved line, as indicated, holds the concentrates higher on the table and spreads them over a wider area of smooth surface at the concentrate end, besides forcing the middlings to work down more rapidly toward the lower side of the table. Thus the fine concentrates in the middlings have a chance to push out from under them and continue to the concentrate edge. The line of division between concentrates and middlings is thus widened, and a more perfect separation takes place.

This practice of carrying the concentrates higher on the table and thus widening the bands of concentrates on the smooth portion of the table surface is important in the separation of complex ores like cerussite and calamine or galena and blende such as we have to treat here in Sardinia. The use of low riffles closely spaced is also important, as it allows a bed of sand to spread well down on the table, and thus the fine concentrates, which are often carried away in the flow of feed water over the table, are caught in this sand bed and travel under it to the concentrate end. The use of high riffles usually causes the ore to crowd forward in a narrow band and to leave the portion of the table below the feed box bare of material, so that the feed water has only the riffles to pass over and the fine mineral in it cannot be caught.

For treatment of slimes, grooves cut into the linoleum are preferable to riffles. In this case a linoleum of 6 mm. thickness is used and grooves 2 to 3 mm. deep and about 6 to 8 mm. apart are cut. The ends of the grooves are tapered to 0 and the points of termination form a diagonal for the upper grooves and a curved line for the lower grooves as shown on plan for riffles.

A Simple Table-Tilting Device

Another feature of the table is the tilting device, which consists of a double wedge *u* inserted between the two central supports of the table. This is entirely carried by the table top, and thus a tilting frame or rods connecting with the foundation or other complicated devices are avoided.

The bars *b* rest on the upper face of the double wedge, while the lower-wedge surfaces rest on bolts *t* carried by the supports *p*, these bolts passing through slots *s* in the vertical web of the angle-bars *c*.

To adjust the table, the bolts *t* at the top of the supports *p* should be loosened slightly, and when the table is adjusted these should be tightened again. The adjustment is effected by rotating the rod *v*, secured at its inner end to the wedge *u* and having near its outer end a screw engaging a nut secured to the frame *a* of the table. A handle *w* is attached to the end of the rod *v*. By moving the wedge, the table can be given the desired inclination. As the central member, or rod, passing through the center of the table is pivoted in the grooves of the central supports and the end of this rod is suitably connected with the head motion, the table may be tilted to any desired extent without affecting the driving mechanism or the supports.

Tilting devices as a rule make a table less rigid and often cause it to lose its proper adjustment, since they give the millmen something to fool with. The mill superintendent should be the only one to readjust a table, and when running properly the tilting devices should be so clamped that they cannot be moved.

Application of the Wash Water

The distribution of the wash water is through an adjustable perforated pipe *m*, as shown on the sketch. In case the line of concentrates is high on the table, the end of the wash-water pipe can be moved down and the line of the concentrates will move down accordingly. Thus with the wash-water pipe alone the necessary small adjustments for the position of the line of concentrates or middlings can be made immediately. The lower half of the concentrate edge is cut off at an angle *o* as indicated, so that the flow of wash water keeps the entire edge wet.

It has been found that a stroke of 12 mm. and a velocity of 300 r.p.m. are best for the finest ores, of 80 mesh and less, while a stroke of 18 mm. and a velocity of 240 r.p.m. are best for ores from 1 mm. and under, or from 16 to 80 mesh.

The advantages of this new table are its regular shape and rigidity, its light weight, small floor space required, simplicity of foundation, free space under table for launders or boxes for products, and its very low cost. The

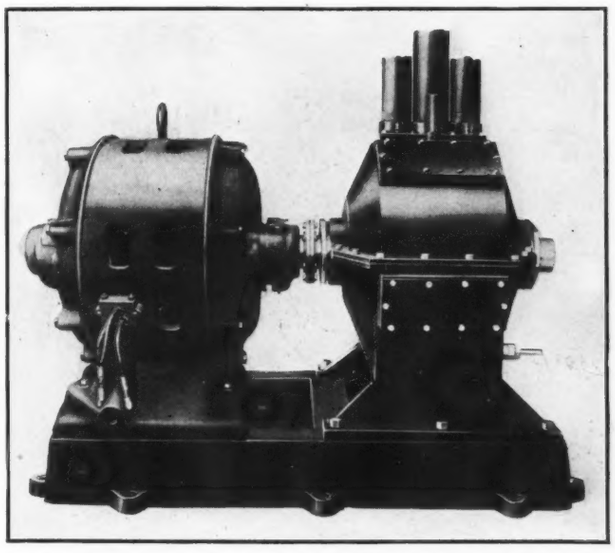
table tops complete with supports and foundation beam should not cost over $50, and to this a royalty of $40 per table must be added for patent rights. A good head motion should be purchased for from $40 to $60, making the cost of the entire table from $130 to $150.

These tables may be built by any good carpenter and blacksmith and the necessary designs and details for constructing and operating them, as well as the permission for their use, may be obtained from the writer.

Jackson Rotary Air Compressor

The Jackson Compressor Co., with office and factory at 1130 12th St., Denver, Colo., has spent about a year and a half perfecting a new type of rotary air compressor. H. O. Jackson was allowed patent for this invention July 16, 1914, his first working model having been completed the preceding February.

The accompanying illustration of the direct-connected motor-driven unit shows this compressor as a small, compact affair. The machine contains no reciprocating parts



JACKSON COMPRESSOR DIRECT-CONNECTED TO A MOTOR

and no valve gearing. Within the member corresponding to a cylinder, ingeniously contrived wings or blades actuated by an eccentric on the central shaft entrap small quantities of free air and these are immediately compressed in a single stage from atmospheric to 100-lb. gage pressure. The volume, or displacement, of each such air compartment is somewhat greater than one-fifth the entire cylinder's volume; hence every revolution of the shaft, with the action of the five compartments, compresses considerably more free air than would be indicated by the cylinder dimensions. Designs and workmanship are so accurate that clearance space is almost nil.

In the size of machine here illustrated the two outer pipes admit outside air to manifolds encircling the cylinder and furnished with poppet-type valves for each of the five chambers between the blades mentioned. The middle pipe is the discharge line, it also having a manifold to receive compressed air through poppet valves from each compressing compartment. These manifolds, as well as the cylinder, are completely inclosed by an outside casing that acts as a water jacket.

Abundant lubrication is effected through an axial hole in the shaft, high-flash oil being distributed by centrifugal action to all interior surfaces, after which it collects in the exhaust manifold and passes into the small drain pipe below, leading to an oil reservoir not included in the picture. The return oil being under the same pressure as the compressed air, a continuous flow is maintained upward from the air-tight reservoir into the shaft, the amount of oil being easily regulated by a simple valve in the line.

Packed Joints Eliminated

There are no packed joints of any sort within the machine, all surfaces being ground to air-tight fits. The compressor runs without noise or vibration. Foundations are unnecessary, the machine being portable in the highest degree. It will operate suspended by a rope with no more perceptible movement or tremor than if it were an electric generator. The intake and expulsion of air is continuous, since several valves are in action simultaneously at every instant of operation. There are, therefore, no noticeable pulsations in either the suction or the exhaust pipes.

The machine will operate equally well running in either direction of rotation, although it is especially designed to work in one direction. Furthermore, it can be used with equal efficiency as a compressor or as a suction pump. In tests for the latter kind of duty, Mr. Jackson states that his vacuum reading has been 22⅝ in. of mercury, which, in Denver, at an altitude of 5,200 ft., is very good.

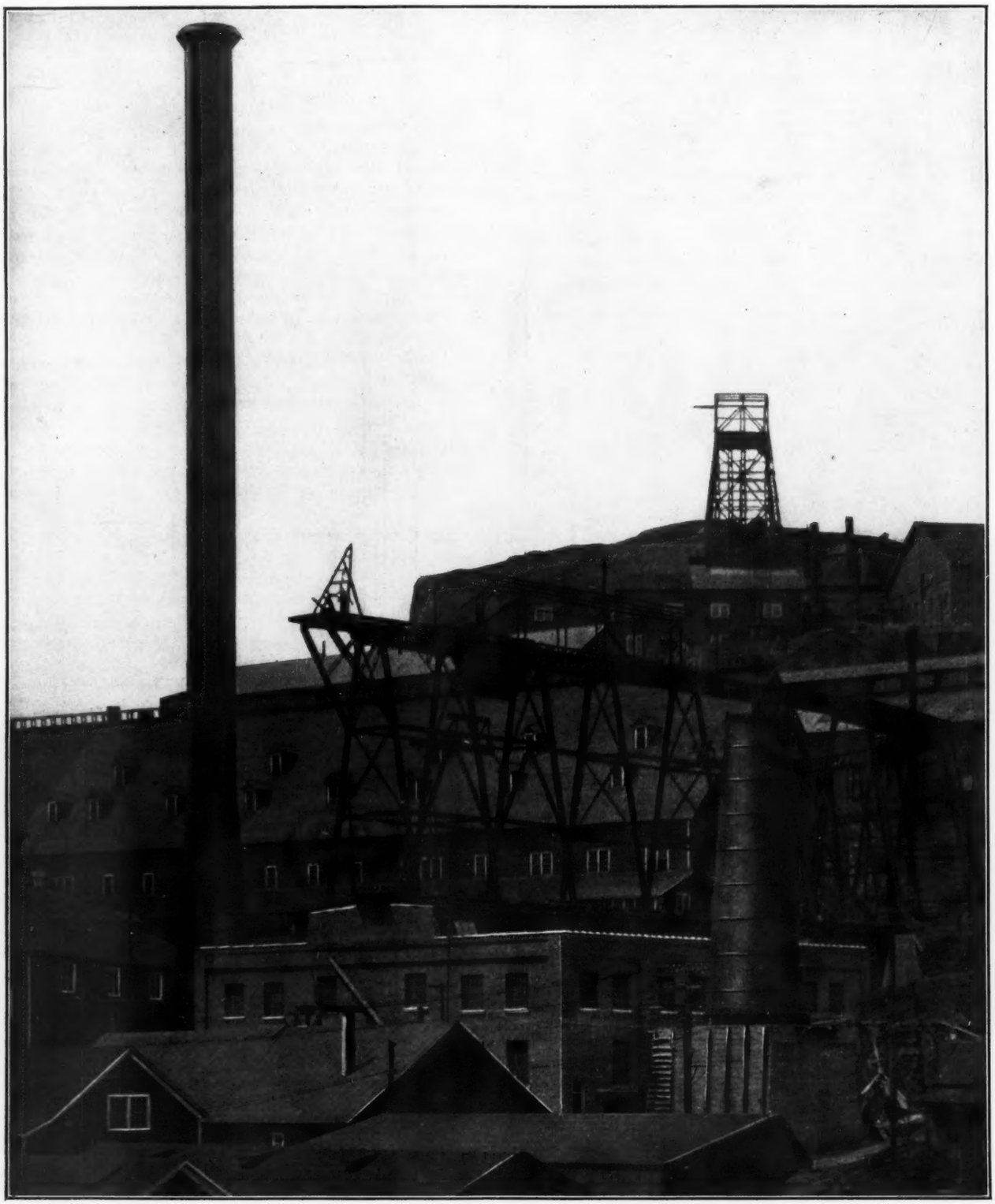
The speed of revolution of the inner parts can be great. The unit here shown has a cylinder with interior dimensions of 7¾x8¼ in., runs at 1,000 r.p.m., compresses 180 cu.ft. of free air per minute to 100-lb. gage pressure and weighs 345 lb. without the motor. Weights of the Jackson compressors will be about one-tenth the weights of standard piston-displacement machines of equivalent capacities. The consumption of power is slightly less than in reciprocating compressors.

Mr. Jackson has fitted an automobile truck with one of these compressors mounted for exhibition purposes, a silent-chain drive from the engine shaft being provided, whereby the compressor can be thrown into action at any place on the road. He is visiting the mining camps and demonstrating the machine. The company is not yet prepared for or seeking orders, the present purpose being merely to acquaint users of compressors with the invention.

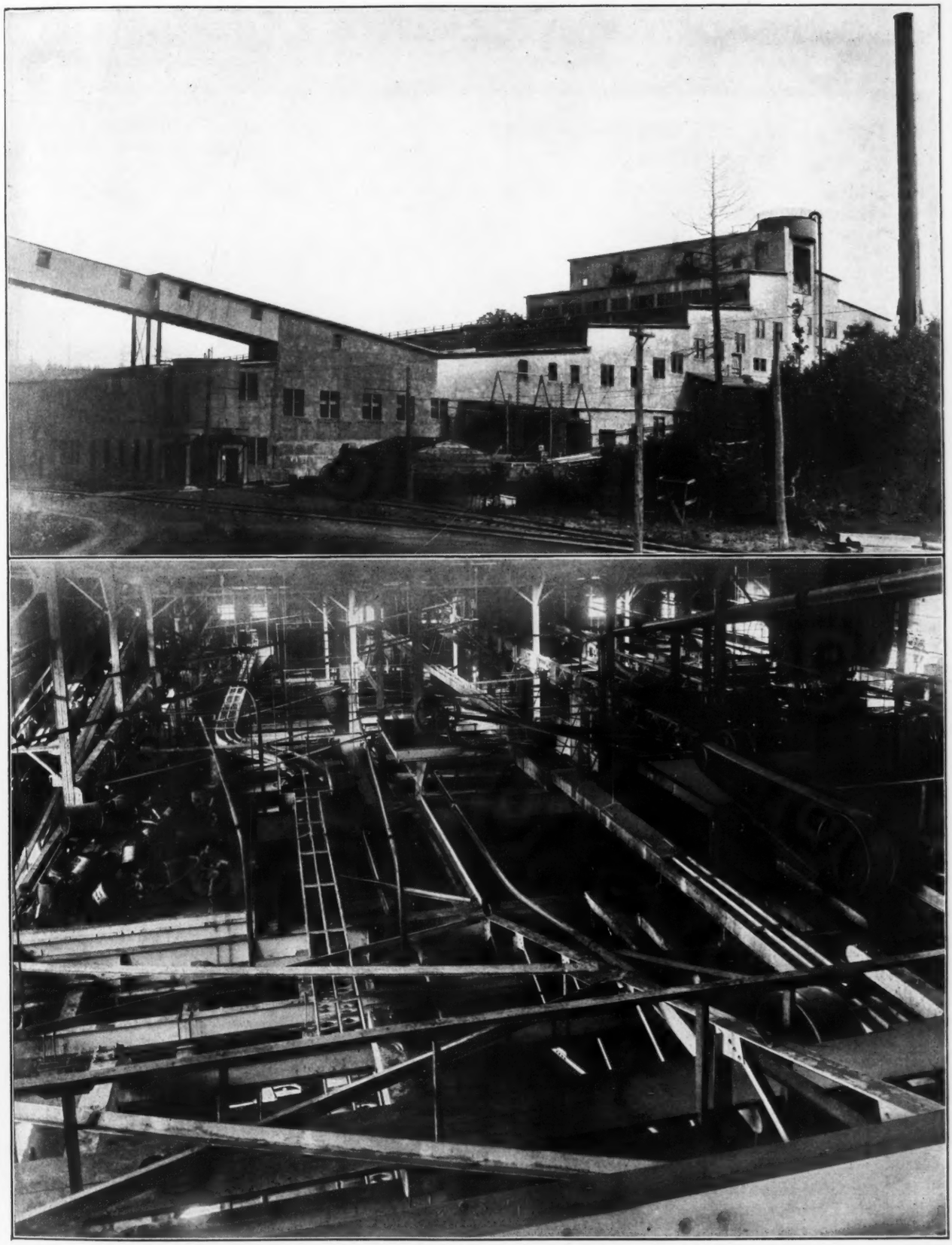
Ten Advantages of Wood Pipe Over Iron or Steel

The Continuous Wire Wound Pipe Co., of San Francisco, in an interesting circular on its new method of winding wood pipe with a continuous wire makes the following 10 claims of superiority for wood over iron pipe: (1) First cost less; (2) more durable; (3) cheaper to transport and lay; (4) lighter to handle in construction; (5) cheaper to repair and to tap for connecting lines; (6) greater carrying capacity in given size; (7) age has no effect on carrying capacity, except to increase the volume; (8) does not corrode; (9) does not affect the taste of water, and (10) is not affected by electrolysis.

Photographs from the Field



NEW BOILER PLANT AT THE HOMESTAKE, LEAD, S. D., SHOWING ONE COMPLETED STACK
This plant will contain six boilers of 600 hp. each, and will supply steam for the new Nordberg hoist at the B. & M. shaft (on the hill in background) as well as for an air compressor and electric generating plant



REDUCTION PLANT OF THE WINONA COPPER CO., WINONA, MICH.

Exterior and interior views of this company's concentrator, which is equipped with standard machinery, such as stamps, jigs, concentrating tables, etc., customarily used in the Michigan copper fields

Correspondence and Discussion

Sensitiveness of Frozen Gelatin Dynamites

In an article on explosives, by Percy E. Barbour, which appeared in the *Journal* of Sept. 25, I noticed the following statement: "Unlike 'straight' dynamite, gelatin dynamite is very sensitive to shock when frozen." I have often heard this statement, but never proof for the same.

On p. 29 of *Bull.* 48 of the U. S. Bureau of Mines, also quoted by Mr. Barbour, is an account of some experiments in the detonation of frozen dynamites. The explosives used in these tests were all rated at 40% strength and included "straight" dynamite, ammonia dynamite, low-freezing dynamite and gelatin dynamite; No. 6 electric detonators were used; all the explosives were in a frozen condition, the temperature of experiment varying in different trials from —16° C. to 6° C. In the case of the first three, only one failure to detonate occurred; that being of low-freezing dynamite at the lower temperature mentioned. In the case of the gelatin dynamite, every cartridge failed to explode and in no case was there even a partial detonation.

From a consideration of the foregoing, it seems to me that if we can place any reliance on these experiments, they effectually dispose of the old belief in the sensitiveness of frozen gelatin dynamite.

J. A. Reid.

Kingston, Ont., Oct. 1, 1915.

Making Primers

Referring to an article in your issue dated June 19, 1915, by J. P. Ruth, Jr., entitled "Making Primers," the method he describes by passing the fuse through the dynamite cartridge is bad. It is important that the powder does not become ignited before the detonator explodes, as otherwise an incomplete detonation will result, causing noxious fumes. Although such a system as described can be employed when using electric detonators, it should be avoided with the ordinary burning safety fuse in order to obviate premature ignition of the powder. No part of the fuse should touch the explosive before reaching the detonator.

W. Gérard Boulton.

Valparaiso, Chile, Aug. 17, 1915.

Cost of Winter Construction

The recent contributions of Mr. Curran and Mr. Wood have been interesting. I hope that other builders will contribute their views about the relative cost of construction in summer and winter; that is to say, metallurgical construction. Everybody knows, of course, that the building of a mill, even in the midwinter of a severe climate is feasible. The Hollinger mill at Porcupine was built under such conditions.

I once built a plant in the Rocky Mountains in weather that was below zero—down to minus 30° F.—a good deal of the time. On some days the masons had to quit, owing to the mortar freezing on their trowels. Except for that, however, there was no trouble about the cement and concrete work that was done under cover, as most of it was. In the following summer all the foundations were as true as when they were laid. Not so in the case of some outside work that was exposed to the sun. It is the alternate freezing and thawing that plays the mischief with such work.

So much for quality. As for cost it is a different matter. It stands to reason that workmen who are trying to do their jobs with stiff fingers are not going to do so much as if they were physically comfortable. Mr. Curran is correct in saying that the cost of construction is likely to be very much more in winter than it is in summer.

B. R. W.

New York, Sept. 20, 1915.

Technical Journalism and Mining Brokers

The *Journal* of Sept. 4 blossoms out with that old perennial—"The mining broker is a gambler." This diatribe differs from sicklied effusions on the same subject in the *Mining Age, Copper, Curb and Mining Outlook, et al.,* in three ways: Their work is more artistic, the *Journal's* is the more sincere, theirs carries its antidote, slow but deadly, in the advertising columns beside the editorial, while the *Journal's* is rendered innocuous by the painful adage which echoes raucously in the wake of most humanitarian, soul-saving and money-safeguarding sermons and which may be summed up in: "Deeds, not words."

Mining swindles were a prolific source of income for certain satraps of Persia 3,000 years ago, but mulcting the public was the legal industry in those days for the man-higher-up. What has the *Journal* done about it in the last six years? In 1909 the *Journal* cleaned an individual cesspool; unfortunately it used an evanescent antiseptic instead of dynamite. That the Augean stables overflow again is proved by its own aforementioned editorial. Permanent sanitation of the mining industry is beyond the strength of any single available Hercules, whether he works with a linotype, typewriter or human gas; yet it is surely within the prerogative and power of our strongest technical journal to lay the foundation for an organized activity which will accomplish the desired result.

Civilized progress, to be permanent, must be based on popular education. A religion may be promulgated with no other motive power than faith; crime, of the purely animal variety, can be hampered by legislation; but protecting the ubiquitous folly of humanity against itself, whether in the matter of typhoid germs or stock certificates, becomes a permanent possibility only when potential sufferers are shown that filth and disease are one, or that the mining broker's much advertised passes to the alms-

house are the most expensive misery with which luxury has ever baited her golden hook. Our engineering fraternity, organized with the assistance of the technical press, possesses the only voice that could effectively instruct the public. It has never tried.

Whence this hitherto insuperable aversion of American mining engineers to strike at an evil that confronts the majority of them in their daily work? To call the body of these honorable men venal—the men who after all are the backbone of the business (to say nothing of the fact that they are *Mining Journal* subscribers)—would be, as far as really useful editorials are concerned, a transfer of the shoe that pinches a small corn, from the left foot to the right, where it would contort the whole foot. This would produce a cramp in the publisher's income tax without ameliorating the condition of that great tribe—the American sucker—whom, in Broad Street, we have always with us. The difficulty lies not in want of good intention or courage among mining engineers, but in lack of organization.

When I am asked to survey, for a consideration, a tract of sand and shingle rock somewhere north of Winnemucca, do I turn down the job because I don't think there's any appreciable quantity of metal (at least in a vertical direction) closer than the molten core that separates us from China? No. My house is glass, yet it's safe if none throw stones save they who be without similar sin. Should the promoter later use my plat as a stock-selling argument, pronouncing me "one of the best-known engineers in the state," do I sue him for libelous exaggeration? No. I hope for the worst because that is the best: May the promoter or broker steal everything in sight within 90 days and drop the venture, for thus will accrue the, in the aggregate, least evil to the least number.

Engineers will always do more or less work on doubtful prospects and their reports, however honest and correct, are always amenable to misinterpretation by stock salesmen because the most hopeless-looking ground may conceal the richest ore. The remedy will lie in the ready availability of an authoritative statement as to the ascertainable condition of any mine or prospect offered to the public.

The essentials of human nature have not altered since the cave-man era. We can expect no diminution in the number of people willing to buy "1,000 shares of Euripides Oil Co. stock for $30," for isn't there "A 33% advance on this oil stock Monday, Sept. 20"? A similar announcement appeared this week in a paper of Joplin, Mo., the most active mining district in the country today. Here we have several large and countless small mines that are working at fair profit for everybody concerned. There's not a live fake broker in the town, although we've had a year's boom in production. The local business community is as firmly set against the prostitution of its mineral as of its human resources; yet, probably because the manager of the Joplin paper does not realize that he is doing for another district what he does not want to see in his own, he spills that six-column stain on his own sheet. Now for the vital question: Has any mining engineer called the attention of that publisher to his mistake? Can readers of the advertisement ask any mining engineer for advice on the Euripides Oil Co.'s prospects for oil and obtain that advice at a price within the reach of a purse opened by the offer of 1,000 shares for $30?

Let an institute of mining engineers organize an information bureau that shall have on file duplicate reports of all work done by the members of that institute. To these reports might be appended a little private mark such as Dun and Bradstreet use, then AA1 will not be set against mining promotions quite as frequently as is at present done in prospectuses. The correspondent system of the *Journal* could be utilized as a skeleton for a network of information agencies responsible to the central bureau. Their work would be far from perfect, but it would be subject to a definite check; gross misuse of the confidence placed in its men would be known to threaten disbarment from connection with any body of approved standing in the professional mining world. The public would at least have a chance to get some of the information it needs. Educational publicity could be promulgated by the bureau, training investors to a clear conception of the hazards as well as the opportunities in mining stocks. Many general newspapers could be brought into line with little trouble, and in time the majority of them. Mining-machinery makers may be persuaded to furnish some of the funds necessary to the campaign, for these manufacturers are vitally interested in seeing investment money go to users of machinery rather than to smudgers of printer's ink.

If we will face the fact, we know that a cloud hangs over our business in the public estimation. This cloud will disappear within 10 years if we but act in unison, and the commercial world will recognize that the greatest, most profitable and safest business, by daylight or candlelight, is mining.

ARTHUR PRILL.

Joplin, Mo., Sept. 10, 1915.

The Situation in Mexico

I have just read in the *Journal* of Sept. 11 some "special correspondence" from Mexico, in which the writer makes a rude criticism on the last decree of Carranza on mining taxes. This criticism I consider unjust, and I wish to give the readers of the *Journal* my own views on this subject.

Formerly the annual taxes on mining properties had been only $3 per hectare (2½ acres). The last decree of Carranza establishes an annual tax of $6 per hectare on a property not over 10 hectares; $7.50 per hectare on what exceeds the 10 hectares and is less than 20; $9 per hectare on that from 20 to 50; and $12 per hectare on all above 50 hectares. This is only an application of the proportional tax to mining property and has been very well received by all single-taxers in this country, and they would see with pleasure these same principles applied soon to rural and city properties. It will promote the subdivision of the property, making the earth available to more individuals, which is the fundamental of prosperity in any country.

At present the mining interests of the Republic, as well as agricultural lands, are in the hands of a few individuals and corporations, which hold large tracts of mineralized lands that they do not develop or explore in the least, only waiting for the opportunity to sell at a high price what has cost them almost nothing. This is not fair. The effect of the new mining tax, we hope, will be to promote the subdivision of the mining properties, forcing landlords to abandon the greater part of their mining

holdings in order to work the rest; and hundreds of prospectors will rush to the freed mineral lands, where we expect to have in the near future many small lively mines working successfully, instead of large dead property producing nothing; and all this will be highly beneficial to the prosperity of mining industry of our country.

Small companies, with hardly enough capital to explore a claim of 4 or 5 hectares, are now holding claims of 20 to 50 hectares, which they cannot develop. The new tax will oblige them to concentrate their attention and efforts over a small area, and the results they obtain will be far better than formerly, while the mining tax they must pay will mean little to them.

To powerful companies working successfully great claims of hundreds of hectares, worth many thousands dollars each, the new tax is of little significance, and it only represents a fraction of 1% of the property's value.

F. ROEL.

Monterey, Mexico, Sept. 25, 1915.

Fettling Reverberatories

Referring to L. D. Ricketts' letter in the *Journal* of Jan. 23, 1915, intimating that Harry Charles, who was employed at Cananea at the time the roof-fettling experiments were being made there, and I were identical, I have not been able to make earlier reply owing to the time necessary to secure evidence of the fact that I was not the Harry Charles referred to, that I was not in Cananea during the period in question, and that I have never been there.

I have recently been in communication with several men who were familiar with my work in Butte and Salt Lake in 1905 and 1906-1907. These men know that I was not working at Cananea during these years, as can be seen from the following quotations from their letters. From Thomas D. Hughes, Tooele, Utah, July 7, 1915:

> In regard to your inquiry about using ore for the lining in the reverberatories at the Montana Ore Purchasing Co.'s plant, it was on No. 4 furnace before I went to Humboldt, Ariz. You experimented on both the stack and the charging; you had a pipe going from the charge floor through which the Snowstorm ore was fed and after we came down to the Bingham Consolidated you fed with the self-feeder. It is "all the go" at all the plants now. In Anaconda they are charging nearly all on the sides; the same at Garfield, and they are doing so well that they are doing away with the blast furnaces.

From the letter of John C. Slater, Midvale, Utah, July 9, 1915:

> In regard to your patent reverberatory feeder, I have not gotten everything clear. After a period of 10 years many things have been forgotten, but I do know that you were intending to put hoppers to use siliceous ores for claying up (fettling) the furnaces at Butte before shutting down there. I also remember that on one of the furnaces—I believe it was No. 3—we cut out a brick from the roof along the side walls, about every 2 ft., and clayed up the sides that way with ore. I do know that while at the Bingham Consolidated we also used a feeder to charge calcine and flue dust continuously in very small quantities—but we did not get that completed.
>
> It seems to me that there was some shafting and pulleys or sprocket gearing got ready at Butte for charging but I cannot remember that it was ever put in place. . . .
>
> I remember hearing you say that some day these furnaces would be charged differently, and you were always telling us to keep the ore banked high against the sides and bridge-wall, so the charge would be thinner in the center of the furnace. You would say, never mind if the sides are not ready as long as the center is clear so you can skim. If I remember rightly we made two furnaces do what four did when dropping all the charge at the center.

Mr. Hughes and Mr. Slater were the general foremen at the Heinze plant in Butte, 1905-06. They both filled similar positions in 1906-07 at the Bingham Consolidated near Salt Lake City. I could name several others that worked at the Butte plant in 1905, but these two letters will be sufficient to prove who was the first to drop ore around the sides of a reverberatory furnace for fettling and smelting purposes.

In the spring of 1905 at Butte, Mont., while in charge of the Montana Ore Purchasing Co.'s works (Heinze's plant), I drew my first plans of a reverberatory furnace with side hoppers to feed siliceous ores for fettling and smelting purposes. We were treating a very profitable ore from the Snowstorm mine in the converter linings and decided that it would be a good substitute for silica in the reverberatory furnace for fettling. We tried it, but it failed as we could not make it stick to the walls. Later, we cleaned off the bottom in front of the bridge-wall and back angles and made a solid foundation for the ore, which we dropped through the roof. This seemed to hold fairly well, but before proceeding further Mr. Heinze wished me to perfect a continuous feeder that I had had in mind and to patent them both at the same time, since they are capable of being applied simultaneously. Before my plans were worked out Mr. Heinze sold his Montana interests to the Amalgamated and I was instructed to take my plans and adopt them at the Bingham Consolidated plant in the Salt Lake Valley. It was my intention to feed everything at the sides in Butte, but he made me add small charges at the center when we went to Utah.

In the spring of 1906 I started to remodel the reverberatory furnace with the idea of incorporating my feeding and fettling scheme and secured the assistance of W. N. Tanner, of Salt Lake City, now chief construction engineer for the Anaconda company, in preparing the plans and to work out the unfinished mechanical device. It was Mr. Tanner's drawings, based upon my old drawings from Butte, that went forward to prepare the patent application.

In the early days of reverberatory smelting, I was continually trying to figure out how to eliminate the labor and delay incident to fettling. After studying and experimenting with the subject for 20 years, I finally decided on the method of dropping the materials on the side walls instead of trying to throw these materials across the furnace from a small opening on the other side. That always appealed to me as a wasteful method, because it was an exceedingly exhausting task for the men and not more than one in four could place more than 60% of the material where it belonged; furthermore, the furnace became much cooled during this operation and smelting could not be resumed at full speed for some time thereafter.

The inefficiency of the old shoveling method of fettling contributed to an unsatisfactory base for the fettling material to rest upon. I had proved in a small experimental way in Montana that if a satisfactory base were secured, the material could be dropped along the side walls or bridge and made to stick, just as it does on the bottom of the furnace when charged in the old way too rapidly. This led me to the development of the idea of dropping the material along the side walls, and then I also conceived the plans of a more satisfactory distribution of the charge over the furnace, as shown in my earlier drawing at Butte. This drawing shows a bank of ore dropped along the side wall and the fines distributed over the bank and the remainder of the hearth.

At the Bingham Consolidated plant we were not able to apply these ideas exactly as outlined in my patent papers (U. S. Pat. 871,477). I wished to feed practically continuously dropping calcine on siliceous ore and corrode the siliceous-ore bank instead of the brick walls. I also wished to be able to charge anything from the finest material to ores the size of goose eggs, thereby making the reverberatory furnace more efficient than ever before. While many people were skeptical or ridiculed my plan for preventing corrosion of the side walls by dropping material against them instead of trying to throw it across the furnace, it is noteworthy that very few smelters are now attempting to throw their fettling materials across the furnace and thus cooling it down. They have incorporated in their practice my idea of preventing corrosion by dropping the ore against the edges of the hearth.

HENRY L. CHARLES.

La Fundición, Peru, Sept. 6, 1915.

Fineness of Crushing for Assaying

It may be well to preface any discussion of this subject by saying that, while there is an impression that an undetermined, intermediate degree of fineness gives the highest assay results, there is not, so far as I know, any definite information on the subject, such as screen analysis of the sample and slag assays. And it is not positively known whether this is true with all characters of charges, and the exact cause.

We may accept the theory that some of the particles of gold and silver in a sample are so small that they would be held in suspension if not dissolved by the lead, and from this it is safe to assume that the gold and silver must be liberated before the lead has settled, which condition would not obtain in a coarse sample. I am not so sure, however, that the underlying cause is the same for finely ground material, as suggested by Mr. Dewey (*Eng. and Min. Journ.*, Aug. 21, 1915). His premises are none too well taken. It is quite possible that the dusting loss is considerable with finely ground samples, and I have seen cases where this amounted to over 10%. (This is not saying that the sample was properly assayed.) The sample is usually the most infusible constituent of charge, retaining its dry state the longest, with opportunity of being lost with evolved gases.

The effect of boiling is a question which we have been investigating for some time, and find the results are so influenced by contributing conditions that a definite statement is undesirable.

As a single illustration of the difficulty in determining the exact effect of boiling, the following experiment[1] is given:

Jewelers' polishings screened through 150 mesh. The eight charges were fused and cupeled together. The assays for the two different charges were placed alternately in the furnace.

	— Charge —		No.	Pb Reduced		Silver, Oz. per Ton	
	A	B		A	B	A	B
Sample, a.t....	0.2	0.2	1	22.6	21.2	4333.5	4306.0
SiO_2, grams...	5	3	2	21.3	21.3	4337.5	4297.5
Na_2CO_3, grams.....	12	15	3	21.8	21.2	4329.0	4313.5
PbO, grams...	50	37	4	22.5	20.6	4316.5	4317.0
$Na_2B_4O_7$, grams.....	5	7	Average	22.05	21.08	4329.1	4311.25
Argol, grams..	2	2					

Slag Volume	A	B
Maximum boiling	105 c.c.	45 c.c.
After fusion	11 c.c.	8 c.c.

[1]Experiment by T. L. Lee, metallurgical student.

The natural inference is that the results substantiate Mr. Dewey's contention, but the slag assays leave the question in darkness. Slags 1A, 2A, 2B, 3B were assayed by adding flux to make them of equal composition, and gave practically the same results: 0.9, 1.0, 0.9, 0.9 mg. of silver.

Mr. Dewey's statement in reference to the niter method considers a type of charge which has been largely superseded. The modern high-litharge niter charge boils the least and produces the most fluid slag of any charge we have, and yet is the best for excess reducing ores. It must be admitted that a lead button larger than usual is required[2], but there is no proof that this is necessitated by lack of boiling. It may be a question of relative solubility. We know that slags high in uncombined litharge will contain more silver than where the litharge is satisfied with silica, and we believe that there is an equilibrium between the amount of silver dissolved in any particular slag and the lead button, and that this varies with the ratio of lead to slag. The following illustrates this point: Two slags, from the foregoing experiment, were melted over 10 grams of lead, in compact form, for 30 min. The resulting buttons on cupellation gave 0.56 and 0.80 mg. of silver, while the slag assay of parallel fusions, as previously noted, is 0.92 mg.

These results show a relation to some of those for copper presented by Frank E. Lathe in his interesting article on "Metal Losses in Copper Slags" (*Eng. and Min. Journ.*, Aug. 7, 14 and 21, 1915).

The fallacy in regard to sodium bicarbonate ($NaHCO_3$) dies hard, particularly as there is neither theoretical nor practical evidence in its favor. Bicarbonate when heated decomposes as follows: $2\,NaHCO_3 = Na_2CO_3 + H_2CO_3$, the latter of course being dissociated. As the reaction is to all intents and purposes complete before any fusion takes place, there can be no stirring action except in the dry state, with doubtful advantage. The boiling in a charge is produced by the gases evolved from oxidation of reducing agent and the carbon dioxide (CO_2) displaced from sodium carbonate (Na_2CO_3), which is the same in amount whether the normal or bicarbonate of soda is used, provided they are employed to give equal quantities of sodium oxide (Na_2O).

As practical evidence: In a law case we used normal carbonate for 25 samples from a camp where it was insisted that bicarbonate was essential for the best results. Our results were about 0.25 oz. higher than those obtained by our opponents. The samples contained approximately 25 oz. of silver and had a siliceous gangue. Further, after using the normal carbonate for 10 years, adopted after careful testing with satisfactory results and a saving of 50% in cost of sodium oxide (Na_2O) content, we prefer soda ash to bicarbonate.

New York, Sept. 26, 1915. E. J. HALL.

Assay Charges at Salt Lake

Only a few weeks ago there was a great parade made of the determination of the Government not to compete with the local assayers at Salt Lake City: therefore, the United States Assay Office would make a charge of $3 per determination. Now we hear that the charge will be $1. How about competition?

Salt Lake City, Oct. 8, 1915. STUNG.

[2]"Assay of Gold and Silver by Iron-Nail Method," "Eng. and Min. Journ.," Dec. 13, 1913.

NEW PUBLICATIONS

REPORT ON THE SALT DEPOSITS OF CANADA AND THE SALT INDUSTRY. By L. Heber Cole. Pp. 174, illus. Canadian Department of Mines, Mines Branch, Ottawa.

GUIDEBOOK OF THE WESTERN UNITED STATES. Part D. The Shasta Route and Coast Line. By J. S. Diller and Others. Pp. 142, illus. Bull. 614, U. S. Geological Survey. May be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at $1 a copy.

GUIDEBOOK OF THE WESTERN UNITED STATES Part C. The Santa Fé Route with a Side Trip to the Grand Canyon of the Colorado. By N. H. Darton and Others. Pp. 194, illus. Bull. 613, U. S. Geological Survey. It may be obtained from the Superintendent of Documents, Washington, D. C., at $1 a copy.

TRANSACTIONS OF THE AMERICAN ELECTROCHEMICAL SOCIETY, VOL. XXVII. 5½x9, pp. 486, illus. Published at the office of the Secretary. South Bethlehem, Penn.

Contains proceedings of the meeting of April, 1915, together with the papers presented and discussion thereof.

"THE ENGINEER" DIRECTORY. 5¼x8, pp. 176, paper. "The Engineer," 33 Norfolk St., Strand, London, England.

This will be a very useful book to those who are interested in foreign manufacturers of machinery and engineering supplies. It is a classified compilation of the specialties advertised in "The Engineer," the publishers of which issue it gratuitously.

POOR'S MANUAL OF INDUSTRIALS FOR 1915. Sixth annual number. 6x9, pp. cliv + 2872; $7.50. Poor's Manual Co., New York.

The sixth number of this well-known Manual contains about 412 pages more than the 1914 issue. It is impossible to say how many pages are devoted to mining companies as they are not given in a separate section as was formerly done. However, the previous issue had 375 pages devoted to mining, and at the same rate of increase the total number in the present volume is about 435.

As in former issues the volume covers all the important companies, giving complete and accurate information regarding their organization, officers, holdings, earnings, dividends, etc., compiled from official sources. In a volume of this size it is astonishing how nearly up to date it has been brought. Thus, we note certain matters referred to, which happened in mid-August.

MECHANICAL DRAWING. With Special Reference to the Needs of Mining Students. By Joseph Husband. 8½x11, pp. 79, illus., paper; 80c. Longmans, Green & Co., New York.

It is rather interesting to see a book published on mechanical drawing—a so much overwritten subject—with a definite aim. Although the book meets all the essential requirements of general mechanical drawing, containing many examples known to all branches of engineering drawing, the chief value of the book seems to be in the effort to familiarize the student of colliery engineering with all the details with which they are in everyday contact. The language is clear, concise and a well-deserved praise is to be expressed on the legible and neat-looking line-engraving plates—something which is badly lacking in the average publication on this branch of art.

A. L. ORMAY.

UNITED STATES MINING STATUTES ANNOTATED. By J. W. Thompson. 6x9, 1772 pp., cloth; in two parts. Bulletin 94, U. S. Bureau of Mines. For sale by the Superintendent of Documents, Government Printing Office, Washington, D. C., at $2.50 a copy.

This bulletin is a compilation of all sections of the United States Revised Statutes, and of all acts of Congress relating to mines, mineral lands and the mining industry on the public lands. It does not include the state laws, which may be taken up by the Bureau of Mines in the future. References to Alaska and the Philippine Islands are included, and it is the only complete work in its field.

All sections and acts are annotated. These consist of abstracts of decisions of all courts and public officers wherein any of these sections or statutes are explained, construed and applied. The annotations are arranged under each section or statute with appropriate title lines in definite order, and consist of plain propositions of law, and point out how the courts have cured many defects, made clear the uncertainties, and aided in the practical application of these statutes. The large number and wide range of these decisions show that the practical value of the mining laws depends on their present status as established by the courts. The person interested is thus aided in determining the course to pursue in applying any given act to his mining enterprise. The work is indexed and any desired subject may be readily found.

Calumet & Hecla Report

The Calumet & Hecla Mining Co., Calumet, Mich., reports that in 1914 it produced 53,691,562 lb. of copper at a cost of 11.35c. per lb., which it sold at an average of 14.01c. per lb. There was 2,592,462 tons of rock treated, yielding 20.70 lb. of copper per ton. The cost of mining and milling, excluding construction, was $1.85 per ton of rock. The construction cost was equal to 1c. per lb. of copper. The following table gives a comparison of production and costs for the last four years:

	1911	1912	1913	1914
Tons of rock treated	2,909,972	2,806,610	2,035,625	2,592,462
Mine cost per ton of rock, excluding const.	$1.84	$1.91	$2.38	$1.185
Pounds of refined copper produced	74,130,977	67,856,429	45,016,890	53,691,562
Pounds of copper per ton of rock	25.47	24.18	22.11	20.70
Cost per pound for construction	0.27c.	0.80c.	1.54c.	1.00c.
Total cost per pound of copper produced	8.52c.	9.86c.	14.25c.	11.35c.
Price per pound received for copper sold	12.82c.	16.65c.	15.77c.	14.01c.

The Conglomerate lode produced 37,996,045 lb. of copper from 1,439,986 tons of rock. The average yield of this rock was 26.38 lb. of copper per ton and the average mine cost, excluding construction, was $2.37 per ton. This copper was produced at a cost of 10.42c. per lb. The following gives the depths of the operating shafts on the Conglomerate lode: Calumet No. 2, 6,186 ft.; Calumet No. 4, 7,995 ft.; Calumet Nos. 5 and 6, 6,155 ft.; slope shaft, 1,588 ft.; Hecla No. 6, 7,874.6 ft.; Hecla No. 7, 7,977.7 ft.; South Hecla No. 8, 6,102 ft., and South Hecla Nos. 9 and 10, 7,930.5 ft. The Osceola lode produced 15,695,517 lb. of copper from 1,152,476 tons of rock, averaging 13.62 lb. net yield of copper. No work was carried on in the Kearsarge lode during the year.

The following table gives a comparison of results at the old recrushing plant (No. 1) and the new crushing plant (No. 8) during the year. Sixteen of the tube mills in the new crushing plant were started during the summer:

	No. 1 Plant	No. 2 Plant	Both Plants
Tons of coarse tailings crushed	351,929	75,630	427,559
Pounds copper per ton in material treated	11.52	11.84	11.58
Pounds of copper saved per ton	3.74	4.59	3.89
Pounds of copper produced	1,316,704	347,363	1,664,067
Cost per pound, excluding smelting and selling	7.38c.	5.66c.	7.02c.

In April, 1915, work was again commenced on a leaching plant to re-treat the tailings from the recrushing plants. At the smeltery the new electrolytic plant is now working to its full capacity of about 65,000,000 lb. of copper per year. Dividends of $1,000,000 paid during the year bring the total dividend disbursement to $124,250,000 at the end of 1914. Cash and quick assets amounted to $7,432,236 and current liabilities to $529,370, leaving a balance of quick assets of $4,134,000. There are further liabilities in the form of 10-year 4% notes dated Feb. 18, 1909, aggregating $4,134,000. The following stocks are owned and not included in the assets stated: 24,512 shares of the Ahmeek Mining Co.; 41,000 shares, Allouez Mining Co.; 41,500 shares, Centennial Copper Mining Co.; 19,100 shares, Cliff Mining Co.; 50,100 shares, Gratiot Mining Co.; 32,910 shares, Isle Royale Copper Co.; 152,977 shares, La Salle Copper Co.; 37,550 shares, Laurium Mining Co.; 32,750 shares, Osceola Consolidated Mining Co.; 11,207 shares, Seneca Mining Co.; 50,100 shares, Superior Copper Co.; 19,400 shares, Tamarack Mining Co.; 42,702 shares, White Pine Copper Co., common; and 15,799 shares, White Pine preferred.

Editorials

Respecting Ore Contracts and Their Failings

Producers of zinc ore are meeting with increasing difficulties in disposing of their product. New producers are in some cases running around vainly in their efforts to find anybody who will take their ore. On the other hand, some smelters are canceling existing contracts that are so loosely drawn as to permit them to find pretexts for doing so.

This is rather unfair, though what is sauce for the goose is no doubt sauce also for the gander. The matter of ore contracts between miners and smelters of ore has been from time immemorial a loose thing in this country. In other minerals it is different. The miner of phosphate rock, for example, contracts to deliver a certain tonnage of known product within a certain period. If he is unable to do it out of his own property he must buy it in the market.

Many years ago attempts were made to get ore contracts upon such a basis, but it was impossible to do this. Ores are quite different in nature from other mineral substances—phosphate rock for example—that are more uniform in character and composition. A buyer may contract for a certain tonnage of phosphate rock guaranteed to exceed a certain percentage of tricalcium phosphate and to be under certain limits of iron and alumina. If he be unable to deliver the stipulated tonnage he can go out into the market to buy it and may have to do so. The producer of lead ore, on the other hand, might be quite unable to duplicate his product. The smelter contracts for a particular thing, not something similar.

Moreover, miners are loath to enter into contracts for specified tonnages of their ore which they may fall short of in the event their mine should unexpectedly and suddenly peter out. These conditions, and others, have bred a looseness in the contractual relation between buyer and seller. The seller delivers what he has agreed to—if he wants to. If he does not want to, some accident happens in his mine; his shaft gets out of order, or by some uncontrollable event it becomes impossible to produce ore. Perhaps it is not deemed necessary to offer any excuse. About 15 years ago the custom of contracting for ore on sliding scale was introduced in the Joplin district. The sellers lived up to their contracts so long as the net yield per ton of ore was above what they could get in the open market. After a few months the condition changed. The sellers then simply broke their contracts. With them it was a case of "Heads, I win; tails, you loose."

The smelter, to meet this attitude of mind, puts in his contracts provisions about impurities in the ore, which enable him to refuse receipt whenever he wants to, always to the great surprise of the miner, who believes he has a real contract. In fact such contracts mean nothing more than the terms of settlement for such business as both parties are willing to do during the stipulated period. This relates especially to business among the small fry. There are some big contracts that are more binding.

The Old Story of Fraudulent Mining Promotions

A correspondent whose communication appears on another page discusses in a breezy way the old question of who should be the guardian of the unwary against the fraudulent promoters of mining stocks. He makes two suggestions that are good in so far as they go, which is only a little way, but are neither novel nor broad-reaching in their practicability. One of them is that the mining journals of good standing should be more energetic in their pursuit of the wildcats; the other is that mining engineers should organize and disbar from the practice of their profession any member found guilty of improper acts.

Now, it is hardly the duty of the engineering journal to act as grand jury and prosecuting attorney in the case of every suspicious promotion. The editors of a paper cannot, even with the assistance of all of their correspondents, become aware of all the schemes that are being put through to inveigle the public; nor can they spare the time and expense to run down more than an occasional one of those that come to their attention. This may be done now and then for an example, for the sake of drawing public attention to an evil, but to expect more than that is unreasonable.

The individual is in a similar position, without owing the responsibility to the public that the journal does. There is not a mining engineer whose eye does not fall often on some advertisement or prospectus that he thinks suspicious—nay, believes to be fraudulent, and would not hesitate so to advise any client that might consult him. But there is great difference between opinion and knowledge. The client that has confidence in the engineer accepts his opinion. The engineer would hardly be justified in communicating to the public any unsolicited opinion, through the medium of the press or otherwise. If he had knowledge of a fraud being perpetrated it might be his duty to expose it. Such exposures are not uncommon.

It is precisely the distinction between knowledge and belief that constitutes the whole difficulty in scotching the fraudulent promoter. If one of that ilk had been advertising a process of extracting gold out of sea water and had been caught in a diving suit putting gold on the submarine plates that he had represented as extracting the precious metal from the brine, there would be no question about his fraudulent intent or his conviction if the officers of the law could lay their hands upon him. The chances are, however, that he would previously have skipped by the light of the moon, just as the Rev. Mr. Jernegan did.

Let another artist appear, however, with an Adirondack gold-mining company or the supposed extension of an orebody beyond a fault; he will, if cornered, maintain that he honestly believed in the things that he intimated, that he relied upon his "geologists," "engineers," etc., and it is likely to be impossible to prove the contrary,

although everyone experienced in mining may be firm in the conviction that the scheme was fraudulently conceived from the outset. Nobody of intelligence ever was under the illusion that George Graham Rice and Julian Hawthorne ever had any mines of consequence, yet how long and arduous was the adducing of legal proofs in the courts? And even today, Albert Freeman, who pulled the wires that made poor Julian Hawthorne dance, is contesting his conviction on appeal.

It happens on occasion, moreover, that chance may redeem even the baldest kind of a fake. Suppose, for example, that Chicken Bill, of Leadville fame, had promoted a stock company after he had salted the Chrysolite mine, instead of merely selling it to H. A. W. Tabor. The experts would have testified against him to a man, yet his dupes would have forgiven him, as no doubt Mr. Tabor did, and the experts would have been blamed for not being able to look into the ground. The case of the Cananea mines was quite different. There were great outcrops there, great indications of ore, but Colonel Greene, who was a man of the Colonel Sellers type, was hardly justified in making the promises he did. The promotion of his mines through the medium of newspaper broadsides impressed most conservative persons as having all the earmarks of a fake, but the thing made good. Hence the need for caution in summarily condemning some flamboyantly offered enterprises.

The position of mining engineers with respect to fraudulent promotions is perfectly clear. The mining engineer is like other professional men, neither better nor worse. There are shyster lawyers and also there are mining engineers who prostitute themselves. If the public be not discriminating it is the public's own fault. There are organizations—the Institution of Mining and Metallurgy in Great Britain and the Mining and Metallurgical Society in the United States—in which membership means something and whose members would be disciplined if they should transgress.

One other point relates to a clearing house for information about mines. Such information exists in the archives of the several exploration companies and in the files of many mining engineers. There is hardly a mining prospect of promise, besides thousands that are not of promise, about which information cannot be obtained in New York. Such information is often exchanged among engineers. It would be unwise and impracticable to throw it open to the public in the way Mr. Prill suggests.

The eradication of the evil of fraudulent mine promotion is something that can hardly be expected. It has baffled legislators, district attorneys and post-office inspectors. The blue-sky laws enacted in many states are well-meant but humorously ineffective. The actions of the post-office department in closing the channels of the mail and of the Department of Justice in taking chances on conviction where state officials feared to step in have been the most useful things that have been done. There is, however, one relatively easy reform and an important one, namely, a better attitude of the newspapers with regard to their advertising pages. The newspapers that circulate invitations to subscribe to shady and suspicious promotions know that they are aiding and abetting something improper, just as they know it when they are carrying patent-medicine advertisements, and they do it simply for the money it brings them.

Mechanicalizing the Lead Ore Hearth

In a paper just published by the American Institute of Mining Engineers, William E. Newnam, the superintendent of the smelting works of the St. Louis Smelting and Refining Co., at Collinsville, Ill., describes what is manifestly an important improvement in lead smelting in the ore hearth. This method of smelting high-grade ore, relatively simple both in plant and practice, has long been in use in Missouri and at those places in Illinois where Missouri ore is smelted. One of its old drawbacks was eliminated by adding to the smelting furnaces means for the filtration of their smoke—specifically, flues and bag-house—as a result of which the extraction of lead from the ore smelted rose to a high figure, 98% and upward being realized.

This change put smelting in the ore hearth far ahead of smelting in reverberatory furnaces as practiced at Desloge, and also ahead of the roast-reduction, blast-furnace smelting as practiced at Herculaneum. A modernization of the smeltery at Herculaneum kept it in the field, however, the great loss of lead formerly experienced in roasting being reduced, first by the use of the Savelsberg pump and later by the Dwight & Lloyd sinterer.

However, the ore hearth still had the great drawback of extraordinary severity upon the men operating it, they being obliged to work exposed to intense heat, which made their duty well-nigh unbearable in summer, and also exposed to lead fumes in about the worst form. Mr. Newnam succeeded in eliminating both of these difficulties, and incidentally greatly improved the metallurgic results of his furnaces, in fact raising a time-honored type of furnace to an entirely new plane for development. This was an achievement that was worth while.

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Terms for Buying Zinc Ores

A correspondent asks about the new method of buying zinc ores that smelters are introducing in the West. We have heard of no new *method*. Any method of buying any ore must necessarily be the value of the metals extractable from it less a sum that will pay costs and leave the buyer a profit. This principle is expressable in a variety of ways. The *terms* for ore are, however, constantly changing, according as market conditions change. The only new terms for buying zinc ore that we have heard of are the fixing of maximum prices; that is, the smelter will not pay for the zinc content at anything above 8c. per lb., no matter what the spelter market may be; or he may agree to pay for only one-third or one-half of the excess over 8c.

Smelters are adopting such a course in order to avoid being stuck with a large stock of high-priced ore when the market collapses, as sooner or later it will. In view of the plethora of zinc-ore supply they are able to dictate their own terms. Two or three years ago, when spelter was very low and certain ores were especially in demand, some contracts for Leadville calamine were made at minimum prices; that is, the spelter of the ore was paid for at a fixed price no matter how much lower the market might be. Even at the present time the best terms are given for calamines. This is for the reason that many smelters have more distilling capacity than roasting capacity.

BY THE WAY

According to the first mining laws of the old Oriental district in Nevada, miners were exempted from annual location work on proving that they had served 15 days in repelling Indian raiders.

India is ordinarily thought of as one of the diamond-producing countries of the world, but the production of Central India and the Madras Presidency averaged only 45.94 carats per year from 1909 to 1913. The return for each laborer employed was about $7 per year. Rather poor, even for India.

The *Portland Oregonian* contains the following succinct account of an accident at the Lane County rock quarry, 21 mi. west of Portland: "William Clinton Keever today lighted his pipe, then started to load a hole in a rock with 12 sticks of dynamite. He lived an hour and leaves a wife and four children."

The *South African Mining Journal* states that the South African Institution of Engineers has passed resolutions offering its services to the British Government in any way in which they can be used to further the interests of the Allies, either in the line of scientific investigation or in mobilizing existing engineering facilities.

The mystery of the origin of some of the strange market letters on mining stocks that one sometimes sees seems to be explained by the following advertisement in one of the leading financial papers:

WANTED—STENOGRAPHER-STATISTICIAN—Wall Street firm wants services of young man accomplished in stenography, with experience or ability to assist in compiling reports and writing market letters on mines and industrials. State age, experience, salary expected.

The Grove City correspondence of the Philadelphia *Public Ledger* states: "It was learned here that rich deposits of humus nitrogen estimated at over 4,000,000 tons of raw material, the value of which ranges from $9 to $13 a ton, have been discovered about 2 mi. from the city. Because of the desire to purchase land adjoining that under which the deposit lies much secrecy is being maintained. Samples of the nitrogen brought into this city have been pronounced the finest ever found in this country." We have taken three strikes at expressing our feelings on the varying qualities of nitrogen, but we must leave it up to the readers, after all.

In describing "Ghost Cities of the West," in the *Saturday Evening Post* of Sept. 4, 1915, Charles E. Van Loan has gone down to Eureka, Nev., which he characterizes as "The Camp of Nine Graveyards." It was a cruel wag from Salt Lake City who said the town of Eureka had graveyards enough to give a decent burial to everything that ever died there, with the single exception of the town itself. Automobilists who plan to drive their cars to the Panama-Pacific International Exposition, by way of the Overland Trail or the Lincoln Highway, will do well to remember that this joke gets more of a laugh in Pioche and Austin than it does in Eureka. When it comes to the subject of death, Eureka is the least little bit sensitive. True, she has nine graveyards, scattered over the low hills that hem in the town—none of them small and some of them more populous than the county seat in its present state—but she sturdily asserts that in her prime she needed them all; for was she not the second largest town in the state of Nevada? Did not Eureka County hold second place in ore production among the counties of a mining state? In the words of one of her prominent citizens—and all the citizens of Eureka County are prominent, one way or another—"The pennant, set at a hundred and twenty-five million dollars, waves unyieldingly on Retention Mountain." The second-place pennant, you understand; the first-place pennant flies on Mount Davidson.

A careful study of men's fashions has been made by *Engineering and Contracting*, the results of which follow: "Overalls for business wear will remain in vogue at least another season, the most popular shades being sky blue and army brown. There are strong indications that reinforced seats are on the wane. The tendency is plainly to revert to the old-style single-ply effect even though it is less resistant to wear. One regrets that conservatism retards adopting brighter colors for overalls. There is an innate attractiveness, an appeal to the esthetic in the more brilliant hues. Then, too, they often have practical advantages. Leaf-green, for example, is so inconspicuous in the woods and among the tall grass that a foreman clad in overalls of this color may readily come unobserved upon one or more of his gang who are prolonging their vacation beyond all reason. However, leaf green is not insisted upon for evening wear. After 6 p.m. it should be *de rigeur* to don more sedate colors. Dark-maroon pants are a welcome change when worn with a black-velvet waistcoat and a *chic* Stetson hat in one of the mouse grays that are so deservedly popular. Now, a word about the proper buttons to select for overalls. Nothing shows the taste of the well-dressed foreman more clearly than the buttons he chooses. 'Tis a little thing—a button—but much depends on it. The small tin saucers that have served so well for many years are going out. On this point, at least, there can be no question, yet many will regret the change. There was so much that was eminently sensible about the tin-saucer type of overall button. You will recall how readily you could find one if lost in the bunkhouse, even without lighting a match. You had merely to walk around in your bare feet until you felt the sharp circular edges of the tin button pressing deeply into the skin. Then you lifted your foot and removed the button. Also, the old tin button would never split, as do the more beautiful but fragile celluloid substitutes that you must use this fall. A word of caution right here as to the new celluloid buttons for overalls. Considerately handled they are a constant delight. They never rust. They may be had in colors to match the pants, or they may be had in colors that vividly contrast with the pants—just as your personal taste dictates. They depreciate slowly, at least if not brought too near a fire. But avoid scratching a match upon or even near a celluloid button, for celluloid is made, as you may not know, of gun-cotton dipped in nitro-glycerin and then kiln-dried. Clearly, some caution should be exercised by those who adopt this year's styles in overalls and celluloid buttons."

Midvale Steel and Ordnance Co.

William E. Corey, a former president of the United States Steel Corporation, announced on Oct. 6 the details of the formation of a new independent combination of steel companies as follows:

The Midvale Steel and Ordnance Co., organized in Delaware, with an authorized capital stock of $100,000,000, divided into 2,000,000 shares of only one class of the par value of $50 each, today concluded a contract for the purchase of all of the capital stock of Worth Bros. Co., a Pennsylvania corporation, and for all the property and business of the Pennsylvania copartnership trading as the Coatesville Rolling Mill Co.; also for somewhat more than 98% of the capital stock of the Midvale Steel Co., of Pennsylvania, and for all of the capital stock of the Remington Arms Co., of Delaware, which last-named concern has contracted to manufacture 2,000,000 Enfield rifles for the British Government. The company has also under option 300,000,000 tons of iron ore. To acquire the stock and property named and provide working capital, $70,000,000 of the capital stock of the Midvale Steel and Ordnance Co. will be issued.

Neither the Midvale Steel and Ordnance Co. nor the three companies and firm whose capital stocks and properties it is acquiring have any debts other than current and no bonds or mortgages or preferred stock outstanding, and the aggregate working capital of the parent company and its subsidiaries will be in excess of $15,000,000. The money necessary to carry through the transaction has been privately subscribed at par for the stock.

The following are the directors and officers of the Midvale Steel and Ordnance Co.:

Directors—William E. Corey, Albert H. Wiggin, Samuel F. Pryor, Ambrose Monell, Frank A. Vanderlip, Alva C. Dinkey, Samuel M. Vauclain, William P. Barba, Percy A. Rockefeller, Charles H. Sabin, Marcellus Hartley Dodge, and Frederic W. Allen.

Officers—President, William E. Corey; vice-president, Alva C. Dickney; secretary and treasurer, William B. Dickson.

Schwab in New Steel Combine

C. M. Schwab had an all-day conference at the Bethlehem Steel Corporation's office on Oct. 5, with directors of the Pennsylvania R.R., having as its purpose the purchase by Mr. Schwab and his associates of the railroad's controlling interest in the Pennsylvania Steel Co., says the New York *Times*.

On Oct. 12 it was rumored that the Bethlehem Steel Co. did not wish to guarantee the obligations of the smaller companies and that the outcome would be merely a union of the Cambria and Pennsylvania companies. The Pennsylvania Co. owns 54% of the Pennsylvania Steel Co.'s stock and Mr. Schwab desired to take over all of it. The steel company has outstanding $31,200,000 of preferred and common stock and owns all of the stock of the Maryland Steel Co., which has large rolling-mill and blast-furnace capacity at Sparrows Point, Md. More to the point from Mr. Schwab's point of view, the Maryland company has also at Sparrows Point a well-equipped shipyard able to build the largest class of merchant vessel.

Through ownership of all the stock of the Spanish-American Iron Co., the Pennsylvania Steel Co. possesses 52,000 acres of the Mayari ore fields and 17,000 acres of ore lands in the Province of Canay, near Nipe Bay, Cuba. Mayari ores are famous in the industry, the steel made from them being of great value in the manufacture of armor plate and ordnance. This steel is a natural chrome-nickel alloy, and when forged it has from 8,000 to 10,000 lb. per sq.in. more tensile strength and elastic limit than the ordinary carbon steel.

There is reason to believe that control of the Cambria Steel Co. will also pass to the Bethlehem in the near future. The Cambria is also controlled by the Pennsylvania R.R. through the ownership of $22,500,000 of the steel company's $45,000,000 stock, but on this stock an option was given some time ago to W. H. Donner at $50 a share. Mr. Donner is understood to be associated with Henry C. Frick.

The Pennsylvania Steel Co. is made up of three steel- and iron-producing companies and several water, coal and power concerns. The main plant is at Steelton with steel-ingot capacity of 750,000 tons and finished-steel capacity of 500,000 tons a year. Its product in finished lines is diversified, including rails and other railway material, bridgework and many structural forms. Its coal mines turn out more than 700,000 tons a year. The iron-ore properties have produced in the last five years approximately 1,500,000 tons annually.

Reserve Corps of Engineers

The joint committee appointed by the five national engineering societies, the purpose of which was outlined in the *Journal* of Sept. 11, is composed of the following men, each chairman of the committee of his respective society: William Barclay Parsons, A. S. C. E.; Henry S. Drinker, A. I. M. E.; William H. Wiley, A. S. M. E.; Bion J. Arnold, A. I. E. E.; Ralph D. Mershon, A. I. C. E.

This committee, officially known as the Joint Committee of the National Engineering Societies on the National Reserve Corps of Engineers, has selected Mr. Parsons as its chairman and is in communication with the War Department.

A plan is being considered whereby a reserve corps of engineers can be formed, for which, of course, legislation by Congress is necessary, the details of which legislation are now being studied by the War Department. While it has not yet been definitely decided to do so, it is under consideration to issue commissions as officers to such engineers as will meet certain professional and physical standards, and who in times of war would be subject to orders from the Secretary of War as other officers of the army, and in times of peace would perform such duty as would not seriously interfere with ordinary work, but would give each officer some military education and experience. In this way it is hoped to have a large body of engineers that could be called quickly for duty.

The separate committees are still in existence to do the necessary work among their fellow members of the several societies as soon as the decision of the War Department is given and a general scheme of organization adopted.

The members of the committee of the A. I. M. E. on the engineers' reserve-corps movement are: Henry Sturgis Drinker, chairman; Arthur S. Dwight, Warren A. Wilbur.

PERSONALS

J. D. Irving, of New York, is in Butte, Mont., on business.

Ben S. Revett has returned from Colorado to San Francisco.

Henry Krumb and F. S. Schmidt, of Salt Lake City, are in Alaska.

D. C. Bard, of Butte, Mont., has been in British Columbia on business.

L. N. Wagner, formerly operating in California, is in Salt Lake City.

J. Dawson Hawkins, who has been on a holiday to Tahiti, has returned to Denver.

J. A. Van Mater, of New York, has gone to the West on professional business.

H. O. Howard, of San Francisco, is investigating the districts around Lovelock, Nev.

Eugene H. Dawson, of New York, is making examinations in Nevada for Boston interests.

George H. Garrey, who has been in California on examination work, was at Goldfield, Nev., last week.

J. E. Johnson, Jr., will address the Pittsburgh Foundrymen's Association, Oct. 18, on "What Is Good Iron."

C. S. Herzig, of London, is interested in the project to build a seven-mile cable tram to the Alta camp in Utah.

Desaix B. Myers has returned to Los Angeles, Calif., after spending about six weeks in Colorado on professional work.

Kirby Thomas, of New York, has been making examinations in the Rochester and Willard camps, near Lovelock, Nev.

Prof. J. F. Kemp, who has been suffering from overwork, will not take up his academic duties until later in the year.

N. Dickerman, general manager of the Pato Mines (Colombia), Ltd., was in New York last week on his way to the Coast.

Nicholas S. Penn, of the Imperial Institute of Technology, at Tomsk, Siberia, is visiting Grass Valley, Calif., on his way back to Russia..

S. W. Cohen, general manager of the Crown Reserve Co. of Cobalt, is examining a mining property in California, with a view to its purchase by the company.

J. D. Connor, metallurgist for the Government of South Australia, reached San Francisco recently. He will investigate the leaching of copper ores in the United States.

T. B. A. Price, of Boston, has gone to investigate the Rice Lake gold area, in Manitoba, where he expects to make extensive investments if satisfied with the country.

William M. Dailey, private secretary to A. C. Dinkey since 1906, has resigned his connection with the Carnegie Steel Co. and will go with Mr. Dinkey to the Midvale company in the same capacity.

G. C. Bateman, who for the past three years has been connected with the Canadian Mining and Exploration Co., has left that company to accept a position as field engineer for La Rose Consolidated Mines of Cobalt.

M. S. Davys, managing director of the Silverton Mines, Ltd., operating the Hewitt-Lorna Doone group of silver-zinc mines and concentrating mill in Silverton camp, has returned to British Columbia from a business trip to New York..

Edward Hamilton, heretofore assistant general superintendent of the Duquesne works of the Carnegie Steel Co., has been appointed general superintendent to succeed Homer D. Williams, elected president of the company.

W. A. Locke is now resident manager of the Taunton-New Bedford Copper Co., in New York, having succeeded William H. Steele, who held that position for the past 20 years. Mr. Locke has been associated with the sheet-copper business for a period of over 25 years.

Dr. Frank D. Adams, of Montreal, has been in the West, where he and W. J. Dick, mining engineer to the Conservation Commission of Canada, have been investigating deposits of phosphate of lime in the Banff National Park in the Rocky Mountains.

George E. Collins and J. V. N. Dorr have been selected by the Colorado Scientific Society to represent it at the convention in Washington, Dec. 16, to impress upon Congress the need for a revision of the mining laws, which convention is to be held under the auspices of the Mining and Metallurgical Society of America.

Henry M. Rives has resigned the secretaryship of the Nevada Industrial Insurance Commission to accept a similar position with the Nevada Mine Owners' Association. Mr. Rives was formerly with the Pittsburg Silver Peak Gold Mining Co., and a member of the Assembly from Esmeralda County at the last session of the Legislature.

J. P. Keane, who for some years was manager of the Cariboo-McKinney mine and mill in Camp McKinney, British Columbia, and later engaged in developing the Wonderful silver-lead mine, near Sandon, was in Victoria recently, endeavoring to make arrangements to lease or purchase a concentrating mill in the Slocan, so that he and his associates might resume the custom ore-concentrating business.

OBITUARY

Dennis Sullivan died at Denver, Colo., Oct. 10. He was well known in New York and had long been a business associate of Grant Schley in British Columbia and Mexican mines. He was a heavy investor in the utilities companies of Henry L. Doherty & Co. and in other enterprises.

William Watson died in Boston, Sept. 30, aged 81 years. He was for a number of years an instructor in Harvard University and the Massachusetts Institute of Technology and was an authority on mathematics as applied to engineering; he was also the author of several textbooks. He had been secretary of the American Association of Arts and Sciences for a number of years.

Frank H. Blackmar died on Sept. 29 at the Methodist Episcopal Hospital, Brooklyn, N. Y. He came to New York on Aug. 27 from Puerto Andes, Colombia, where he had been engineer for the Chicago mine, was taken ill on the steamer, and after his arrival was operated on for appendicitis. He received his engineer's degree from the University of Kansas, where he was a member of the Phi Kappa Psi. He was also a member of the American Institute of Mining Engineers.

Isaac B. Hammond died at Portland, Ore., Sept. 23, aged 71 years. He was born in Lambs Corners, New York, but removed to the West in early life, where he had been associated with a number of industries and had much to do with the commercial growth of that part of the country. At the time of his death he was president of the Hammond Manufacturing and Electric Co., which he founded more than 25 years ago. Practically all his life had been devoted to the manufacture of mining and electrical machinery. He was president of the Board of Trade of Portland and active in civic affairs.

SOCIETIES

Mining and Metallurgical Society of America—The New York Section will hold a meeting at the Machinery Club, New York, at 6:30 p.m., on Oct. 19. Woolsey McA. Johnson will make an address on the Lungwitz method of smelting zinc in blast furnaces under pressure.

American Institute of Chemical Engineers—The winter meeting will be held in Baltimore, Md., Jan. 12-15. The date selected is somewhat later than usual because summer meeting was held late in August instead of in June as is customary. Baltimore is the center of a considerable number of important chemical industries. Excursions to a number of these will be arranged. The experimental laboratories of the Johns Hopkins University and the Naval Academy at Annapolis, Md., are also of great interest and will be visited. A number of papers on recent and important developments in some of the chemical industries of the United States are being arranged for.

Rice Lake Mining Association of Manitoba—At a meeting held in Winnipeg, Sept. 29, by those interested in the development of the Rice Lake gold fields of Manitoba, an association under the above name was organized with H. R. McTavish as chairman and J. D. Perrin, secretary. Reports compiled from official records were presented showing that 746 claims are in good standing in the Rice and Gold Lake districts and that some $260,000 has been spent in the country. As there are considerable transportation difficulties to be overcome an effort will be made to receive government help in the construction of a road. A committee was appointed to approach the government with the object of securing an amendment to the Sale of Shares Act so as to permit a mining company to offer stock to the public on its being shown that it has a reasonable prospect of securing metal in paying quantities.

Editorial Correspondence

SAN FRANCISCO—Oct. 6

Apex Litigation between the Empire and the Golden Center mines at Grass Valley has been settled out of court, upon agreement between the owners. Under the terms of settlement the Golden Center may work all ledges within the disputed area having their apex west of Auburn St., south of Main St., and north of Grass Valley townsite line, with an indefinite western boundary. The Empire may work all ledges apexing east of Auburn St., north of Main St., and south of the townsite line. It is further agreed that each company may work in the grounds of the other when following its own ledges. This will provide for both companies working in the same area, one above the other. This provision is especially advantageous to the Golden Center which is operated by a new company reopening an old mine in the center of the town of Grass Valley. Development brought the operators into Empire ground, which caused the litigation. The settlement is also of great advantage to the Empire mine as it will enable development of orebodies which otherwise might have been contested by the Golden Center. This agreement to take the matter out of the courts, it is hoped, will have some influence in providing for the same kind of settlement between the Empire and the North Star, which litigation is now in the federal courts.

Mining Week at the Panama-Pacific Exposition offered the greatest composite attractions that were presented in any period during the life of the Fair. The chief attraction, not only to mining men but to the visitors generally who have taken some interest in the various exhibits of mining industry, was the Third Annual Field Meet of Mine-Rescue and First-Aid teams. The initial contest on Sept. 22 was the first California First-Aid meet, in which nine teams contested. The Mammoth Copper Co. team won the contest with a score of 374 out of a possible 500. The Mine-Rescue elimination contest, Sept. 23, between three teams from Washington and two teams from Utah, was won by the Utah Fuel Co. with a score of 461.5 and by the Roslyn Fuel Co. by a score of 442. The First-Aid elimination contest on the same date between nine California teams, three Nevada teams, two Utah teams, and three Washington teams was won by the Kennedy Mining and Milling Co. team of California by a score of 491; the Utah Fuel Co., 473; Pacific Coast Coal Co., Washington, 476; Nevada Consolidated Copper Co., 488. The First-Aid interstate contest on Sept. 24 was participated in by 13 teams representing Alaska, Arizona, California, Illinois, Montana, Nevada, Oklahoma, South Dakota, Utah, Washington, West Virginia and Wyoming. The contest was won by the Homestake Mining Co. of South Dakota with a score of 495. The second largest score was by the Nevada Consolidated Copper Co. with a score of 493, and the next the Bunsen Coal Co. of Illinois with a score of 480. The Mine-Rescue interstate contest on Sept. 24 was participated in by seven teams representing Arizona, California, Montana, Nevada, South Dakota, Washington and Utah. The contest was won by the Utah Fuel Co., with a score of 480; the next highest being the Roslyn Fuel Co., 477, and Goldfield Consolidated, 468. The resuscitation contest was participated in by the same teams as were in the First-Aid contest. The contest was tied by the Homestake Mining Co. and the Nevada Consolidated Copper Co. with scores of 100%. The Nevada Consolidated won the tie.

DENVER—Oct. 7

The San Juan National Park, proposed by Enos Mills, is causing considerable discussion and uneasiness in Silverton. It is feared that the park would seriously discourage prospecting and interfere with the development of the county's mineral deposits. Any proposal which would result in hampering mining activity by introducing difficulties in obtaining and maintaining title to mineral lands will be strenuously opposed by the citizens of San Juan County. They will no doubt make every effort to prevent their county from being included in such a national park if there is any likelihood of such embarrassing restrictions as are feared.

Cripple Creek District's Production, which is steadily increasing, during September exceeded the production for August by 5,000 tons, having a gross value of about $48,000, according to estimates Of the total tonnage—89,800—treated by the various mills and smelteries, the Golden Cycle works at Colorado City handled approximately 48% and the Portland company's three mills, approximately 44%. The American Smelting & Refining Co.'s plants in Denver and Pueblo received about 3,900 tons of an average value per ton of $55. The Portland-Independence mill treats about 10,000 tons of $2 ore per month. October is expected to establish another tonnage record.

Economic Mine Dump is being loaded into cars and shipped at the rate of nearly 400 tons daily. No attempt is made to sort the material. Waste rock at present hoisted through the Gold Coin shaft is also shipped with this dump stuff. At the Elkton mine dump, John Sharpe is ready to start operations with his newly installed plant and expects to handle 200 tons daily. A double-drum steam hoist has been mounted above a receiving bin at highest part of the dump and, by means of drag buckets, will elevate the rock from the lowest portions. Grizzlies, trommels, revolving washers and a sorting belt comprise the equipment below the bin.

Another Vug in the Cresson Mine was opened a short time ago and is sufficiently explored to present a rough estimate of its gross value at about half a million dollars.

BUTTE—Oct. 7

The Socialists Imported an I. W. W., who, according to his own statements, was induced to leave Ireland for the good of Ireland, and last Sunday night they attempted to defy the city and county authorities in Butte and resume last year's interrupted soap-box agitation against all things orderly. The imported agitator and the former Butte socialist mayor were denied the use of the city hall and so they advertised by banners that they would hold an open meeting in front of the hall. The banner bearer was arrested and thrown into jail. He said the ex-mayor had hired him to carry the banner. There was a big crowd on the streets at the hour the ex-mayor and the "importation" were to speak. The former, seeing many officers in the crowd, was a bit diffident about starting anything, but the "importation" nudged him and told him to go ahead. The ex-mayor got so far as to say "Folks," to the crowd, and then the chief of police got hold of his coat collar and one arm and told him to move on. The ex-mayor asked for permission to tell the crowd that he couldn't say anything, but even that was not permitted. Then the socialist ex-mayor and the I. W. W. "importation" headed their followers in a search for a hall, but before they found one they ran up against the county sheriff and a bunch of deputies with "night sticks" and when some of the would-be disturbers got loud they were "nudged" with the sticks, their banners were destroyed, and they were given other evidences of the fact that law and order were triumphant in Butte. When they finally secured a hall a few more than one hundred followers were present to listen. All of which goes to show that Butte, without a socialist administration, is not at all the place it was something like a year ago when the I. W. W. and socialists ran riot, property was dynamited and martial law was brought about in the county.

Local Unions Are Protesting against methods of manual training in Butte Public Schools. How far Butte labor unions can go in their assumed jurisdiction was discussed in a most spirited manner at a meeting held by the Butte school board Oct. 6. A communication from the typographical union in regard to the new printing plant installed in the high school and a report from the school superintendent regarding the position taken by the carpenters' union toward carpenter work being done by the manual training department of the junior high school were submitted. The request of the typographical union that no printing should be done in the school shop outside of regular school work, was granted. The other demand that a practical printer from the union should do the teaching, was held in abeyance, pending the appointment of such a teacher. At the Washington school under the direction of the manual training teacher, boys had been engaged in putting in a partition between two rooms. To this the agent of the carpenters' union objected on the ground that this was work carpenters should do themselves and be paid union wages for. The majority of the school trustees took the position that the work was for the purpose of training the boys in actual carpentry problems

and was not in any sense in competition with the union carpenters. Accordingly the manual-training department was instructed to go ahead and to ignore the demands of the carpenters' union. Whether the latter will take further steps to prevent practical teaching of their trade in Butte schools remains to be seen. Under the rules of the unions, limiting the number of apprentices, boys and girls have no chance of acquiring practical experience and the board held that schools are the proper place for them to receive instruction in these lines of work.

SALT LAKE CITY—Oct. 7

In the New Zinc Camp, in the Lake View Mining District, on the south end of Promontory Mountain, 20 miles west of Ogden, there is considerable activity. Six different properties are operating: The Lakeview, Cedar Ridge, Molman-Smith, Jay Hawks, Corey, and Little Valley. The ore in carload shipments averages about 35% zinc. The Lakeview Co., has paid $12,000 to $15,000 to its five principal stockholders since March. This company produced from the grass roots, so to speak; only $700 to $800 in cash having been expended in development, before it was placed on a producing basis.

SEATTLE—Oct. 6

A Big Shipment of Copper Concentrates from the Beatson Copper Co.'s mine at Latouche, consisting of 2,800 tons, was lost recently when the ore shifted in the hold of the steamer "Edith" and the vessel sank in the Gulf of Alaska. The shipment was valued at $150,000.

Farthest North Camp Yields $690,000 this summer according to the last report brought down from the Koyukuk district. This is an average of $115 per day for the 20 days of the mining season for each man of the 300 operating in that district. The camp lies 140 mi. inside the Arctic Circle and while Koyukuk is extremely rich the difficulties in getting into the district and the high cost of provisions have kept back a stampede. One nugget taken out this summer is valued at over $3,000 while several were taken out averaging $600 apiece. The gold of the camp assays $19.72 to the ounce. Lumber at the camp is worth $600 per M., and during 10½ months of the year there is only one mail. The $690,000 output of the camp last summer is considerably better than the season of 1914 when only $400,000 was produced. The mining season is never longer than 25 days.

First Big Tin-Ore Shipment to the tin smeltery in Seattle will arrive from Buck Creek, Nome district, the first part of November, according to the plans of the American Dredge Building and Construction Co., which installed a new tin dredge there this summer. It now has three machines in the same district, two having operated all season on the Anikovik River. The gravel on Buck Creek contains a large percentage of tin ore and small percentages of gold. The new dredge is equipped with a screen and double flumes, so that no time is lost in cleaning up. A 2-ton truck was shipped up the early part of the year to carry the ore to Nome from the dredge. At the same time a shipment will arrive from Walter W. Johnson of San Francisco who also has a dredge on the same creek from which he took out about 100 tons of tin ore last year. Several small shipments of tin have come down from the North to Seattle before but nothing on a large scale and the results of the smelting will be watched with considerable interest by tin operators in Alaska and the mining interests on the Coast.

DOUGLAS, ARIZ.—Oct. 5

Only a Few Properties Are Working in the northern part of Sonora. The mines at Cananea are working in the smallest way possible as no party has complete control and preparations have been made to close down all the properties should conditions get any worse. Nearly every night the town is entered by bandits connected with neither side and the Chinese stores and small Mexican stores are looted and those who resist are murdered. The Americans and foreigners have armed themselves and are prepared to defend themselves should the bandits attempt to molest foreign properties. Nacozari and El Tigre will be unable to work should the threatened invasion of Villa materialize. Nearly all of the men in both of these camps are Carranzistas and at the approach of the Villa forces they will all retreat to some Carranza base, leaving the mine with none but Americans who are in too small numbers to attempt to operate. At the present time all of the Mexicans within 200 mi. of the border, who are financially able, are bringing their families to Agua Prieta; those who are too poor to send their families out, are going out into the hills where they think that they will not be found by the invading army. Agua Prieta, which is across the border from Douglas, has more people now than it has ever had before and the trains into town are always crowded. There are no houses to be had in Agua Prieta so the people are sleeping in box cars and in the stores. The better class has gone to Douglas and it is now impossible to get a house there. Should Villa come into Sonora it is nearly certain that every mining property would shut down and as even now there are few provisions outside of the mining companies Villa would have very hard picking.

ST. PAUL, MINN.—Oct. 2

State's Income from Iron Properties this year from iron-ore royalties will not be so great as last year. The Leonidas, at Eveleth, will lead the state properties with about 650,000 tons for the season. Based on present explorations the state is assured of an average annual income of $1,000,000 for the next 30 years. Twenty-two state employees are maintained on the Mesabi Range to look after the state's iron-ore royalties, checking operations, tonnages, etc. To Oct. 1 these properties have shipped more than 1,800,000 tons.

BLUE HILL, ME.—Oct. 6

A Large Deposit of Rhodonite at the summit of Blue Hill has been acquired, and is being opened up by C. Vey Holman, formerly state geologist of Maine. This deposit formerly furnished the manganese for the Katahdin Iron Works, Maine's pioneer and only iron blast furnace, which for several decades turned out a considerable output of high-grade charcoal iron. When that furnace went out of blast about 1883, this deposit fell into disuse, and has been practically forgotten. Mining, or rather quarrying, will be simple and cheap, as conditions all conduce to easy handling at low cost. Shipments will be from tidewater at the base of the hill. Analysis of the ore gives SiO_2, 43.12%; TiO_2, 0.12%; Fe_2O_3, 17.53%; MnO, 32.93%; CaO, 3.45%; MgO, 3.48%.

LOVELOCK, NEV.—Oct. 7

A Carload of Antimony Ore from the Sutherland property, at Cole Cañon, 15 mi. northeast of Lovelock, has been recently shipped east by Robert Brown, representative of the Magnolia Metal Co., of New York.

A Small Matting Furnace to treat copper-nickel ores south of Lovelock, near the properties formerly operated by the American Nickel Co., is being planned by W. J. Flick and associates, of Lovelock. The district is about 40 mi. south of the railroad. A small copper furnace on the Boyer mine in that locality is idle but may be started up again. The project for the Southern Pacific to build a cut-off which would make these properties more accessible seems to be suspended for the present.

Tin Ore, Occurring in Veins in Granite, has been found near Battle Mountain, Elko County. Samples analyzed in Los Angeles gave upward of 22% tin. The ore is black and was passed by as iron until very recently. So far most of the discoveries have been in narrow veins, a few inches wide. It is claimed now that a 4-ft. vein has been opened. The deposits lie about 20 mi. north of Battle Mountain. Already 140 locations have been made. Several engineers have visited the district recently, but so far no large interests have taken hold of the prospects, which are controlled by ranch holders in the vicinity. George Russel, Jr., of Battle Mountain, is largely interested in the development of these tin discoveries.

TORONTO—Oct. 9

The Ontario Nickel Commission has completed its investigation of the nickel mines of the Sudbury district, in which it was afforded every facility by the companies interested, who submitted their books and records to a thorough examination. The commissioners will inspect other mines in northern Ontario and will afterwards visit the New Jersey nickel refineries. It is understood that they will make no interim reports and their conclusions are not expected to be made public before many months have elapsed.

The Discovery of Large Nickel Deposits in the Fond du Lac country on the northeast side of Lake Athabasca in Northern Alberta was reported some months since. H. V. Dardier, a prospector who then left for England taking with him samples of the ore with a view of interesting British capitalists has returned in charge of an exploration party sent out by Vickers, Maxim & Co., the noted gun manufacturers of London and Liverpool, who will thoroughly prospect the region. The expedition, which left Edmonton, Alta., for Fond du Lac about three weeks ago, comprises 25 experts, including engineers, mineralogists and assayers and a large force of laborers. Seventeen scows were required for the transportation of their equipment and supplies. The machinery cost $50,000 and the supplies $10,000. The party expect to remain in the district over two years. Their destination was kept secret as long as possible and was not generally known until some time after their departure. The total cost of the enterprise will be about $100,000.

The Mining News

ALASKA

GOLDEN (Port Wells)—Five-stamp mill and other equipment installed by Doctor Chase, of Seward, and associates.

KENSINGTON MINE (Juneau)—Superintendent Rogers and gang of men are doing about 40 days' work, drifting in preparation for more extensive work in spring.

GRANITE MINE (Port Wells)—Graphite mine continues big production. Joe Domenzie, discharged miner, is charged with blowing up powder house at this mine and has been arrested and held for trial. Explosion damaged mill, but no one was injured.

YANKEE BASIN-EAGLE RIVER (Juneau)—Present operating company working Eagle River mine, under managership of B. L. Thane, will take over Yankee Basin claims worked by Pete Early and John G. Heid. This will consolidate large properties and require installation of large power plant and driving long tunnel to run to orebody.

MOUNT ANDREW COPPER MINE (Prince of Wales Island)—After being closed down for three years owing to low price of copper this mine has resumed shipping and has just sent 1000 tons of copper ore to Tacoma smeltery. Large quantity of ore is now on hand and company will be regular shipper. W. J. Rogers is manager.

CACHE CREEK DREDGING (McDougall Station)—Is preparing to freight its new 7-cu.ft. bucket gold dredge to Yentna district back of Cook Inlet this winter. It will have a capacity of 3,000 cu.yd. a day and will be first dredge to go into that district. E. L. Smith is president of company. E. E. Todd, of Redding Iron Works, Redding, Calif., is also interested in company. Chas. Harris, formerly of Marysville Dredging Co., Marysville, Calif., is superintendent.

GILPATRICK CLAIMS (Seward)—Development work on this property carried on last summer has resulted so satisfactorily that owners, Gus Brown, Felix Brown, of Seattle, and G. Sieffert, William Dashley and others of Seward will install stamp mill and aërial tramway on property next spring. Several tons of ore recently brought down from property gave return of $102.76 per ton. This was taken from cross vein which cuts main body of gold ore which gives average of $22 per ton. A 10-stamp mill will be installed.

ARIZONA

Gila County

PINAL MOUNTAIN MINING (Globe)—Will begin making regular shipments of gold ore to smelter from its mine, 8 mi. southwest of Globe.

ASBESTOS DEPOSITS (Globe)—Messrs. Fisk and Snell who recently discovered large deposits of asbestos on Ash Creek, 40 mi. from Globe a e building mill. They recently made shipment of 4 tons of natural product to Japan.

Mohave County

GOLD REED (Oatman)—Reported splendid showing of ore encountered on 375 level. Milling ore in large body has been opened, alongside of which is found considerable rich material. L. L. Moore is manage..

Yavapai County

HAYDEN DEVELOPMENT (Jerome)—Is erecting 200-ton mill at its Copper Chief mine near Jerome. More than 500,000 tons of ore are said to have been blocked out in mine.

BIG LEDGE DEVELOPMENT (Prescott)—Plans have been adopted by company for erection of mill on its Butternut claims recently purchased. Company has also acquired Henrietta mine which was formerly well-known gold producer. Extensive development to be conducted upon newly acquired properties.

ARIZONA CON. SMELTING (Humboldt)—Smelting capacity will be doubled by addition of new reverberatory furnace, necessitated by increased tonnage from copper mines of De Soto company, which totaled 3,200 tons for August and 4,000 tons for September. Daily swing-train service to Middleton will be inaugurated to handle De Soto tonnage and that from other mines at way station. G. M. Colvocoresses is manager.

CALIFORNIA

Amador County

MARSINO (Volcano)—Reported that property will be prospected with diamond drill.

CLINTON BAR (Sutter Creek)—Drifting along channel in progress; prospects of pay gravel.

PINE GROVE (Pine Grove)—Reported that installation of mill is contemplated. Good grade of ore being developed.

Butte County

MANGANESE deposits at Clipper Mills being developed under bond by Noble Electric Steel Co., of San Francisco. Reported that ore will be hauled by autotrucks to Heroult smeltery in Shasta County.

UNDINE (Chico)—D. S. Nesmith, of Boston and San Diego, has secured control and will reopen this gravel property on Butte Creek. Reported that Nesmith will arrange for payment of creditors before purchase payment is made.

Placer County

GOULD (Dutch Flat)—Mineral survey being completed. Owner, J. L. Gould, is one of largest owners of mineral ground in district. Property is developed by 2,200-ft. tunnel that can be made to serve as drainage for Dutch Flat basin. Tunnel has been cleaned out and timbered and car track repaired. Blue lead channel, which has been large producer of gold, is said to cross Gould property.

Plumas County

UNITED STATES EXPLORATION (Quincy)—Development of Granite Basin district on large scale is reported to be contemplated in undertaking of which initial work is being done at Robinson mine where shaft will be deepened 100 ft. during winter. The 20-stamp mill is being dismantled and Sears-Smith rotary mills will be installed with capacity equivalent to 40 stamps.

ENGELS COPPER (Taylorsville)—Survey for narrow-gage railroad from mine in Lights Cañon, through Indian Valley and Indian Creek Cañon to the junction with the Western Pacific Ry. near Keddie is reported to be in progress. Mining company is enlarging its concentrating plant. Electric power line between Butt Valley and mine has been completed and property is now being supplied with electricity. About 200 men are employed at mine.

Siskiyou County

HUMBUG CREEK district is being developed by active operation, including Boyle, Spencer, Summit, High Waters, Ideal, Old Flag and Eliza mines. There are three arrastres in operation and some large cleanups are made. There are several of these mines which were worked in early days when no ore was saved under value of $20 per ton. In the '50s Humbug Creek was known as one of richest producing sections in county.

Tuolumne County

RAWHIDE (Jamestown)—Reported that mine has been sold to men at Blair, Nev., and that new owners contemplate expending about $200,000 in development and remodeling milling plant. Property was originally owned and operated by Captain Nevills, deceased, and is said to have produced several million dollars.

Yuba County

WEST POINT (Camptonville)—Large concrete dam to be constructed for impounding débris and tailings from hydraulic operation.

SOLANO WONDER (Challenge)—Installation of mill and other equipment in progress. Mine is an old producer of high-grade quartz. Present operators giving more attention to medium-grade ore.

COLORADO

Pueblo County

COLORADO FUEL AND IRON (Pueblo)—Has added 250 men to its force in Minnequa steel works at Pueblo making its monthly payroll about $50,000. Rod mill works double time on heavy orders that will require until next spring to fill. President J. F. Welborn states that plant is not filling and will not accept any war orders.

San Juan County

KITTIMAC (Silverton)—New mill nearing completion. Huff electrostatic machine has been installed and management will now add flotation machine. Development work will be resumed in several parts of mine, including west heading on Clark vein.

San Miguel County

TOMBOY (Telluride)—Under management of Exploration Company Ltd., of London, return for month of September shows mill ran 28 days; crushed 13,000 tons of ore, yielding $45,000 bullion; concentrates shipped, $40,500; expenses for period, $56,700; operating profit, $28,800.

Teller County

BLUE BIRD (Altman)—Regular operations by Franklin Leasing Co., which has held this property since last December, are temporarily suspended. Plans are under way for erection of cyanide mill at mine.

PORTLAND-INDEPENDENCE (Victor)—Narrow-gage railroad track that has heretofore been sole access to Independence mine is being rebuilt to standard gage and spurs will be laid to every important building.

ROOSEVELT TUNNEL (Victor)—Total progress during September amounted to 326 ft. On Sept. 20 additional flow of water was encountered in heading of tunnel, in territory owned by Raven and Beacon Hill Gold Mining Co. During few days following, total flow was about 12,500 gal. per min. Breast of tunnel is now about 1170 ft. west of main shaft of Elkton Con. Mining and Milling Co. on southwest slope of Raven Hill.

GOLD SOVEREIGN (Victor)—New shaft will be sunk an additional 200 ft. to total depth of 1525 ft. Work will be performed by Union Leasing Co., which operates property under lease from Gold Sovereign Mining and Tunneling Co., and will be under supervision of C. G. Jackson. Crosscutting and raising operations are in progress and 150 tons of milling ore were produced from development during September. Mine dumps are under lease to Edwin Gaylord, owner and operator of Gaylord mill. Construction of aërial tramway is under consideration, to transport dump material to mill.

IDAHO

Elmore County

BOSTON-IDAHO DREDGING (Featherville)—Operating on Feather River has only worked on small scale this season, owing to lack of water. It is proposed to build 35-mi. ditch to provide more water. Captain Rupert Winters is in charge.

Idaho County

GRANGEVILLE MINE (Elk City)—Under lease and bond to J. J. McKim, H. Cone and Andrew Prader has just completed mill run on ores from 115-ft. level. Results satisfactory. Lessees propose installing compressor. Will carry on extensive development work this winter. There is a 5-stamp mill on property; several hundred tons of ore have been mined and milled since first of year.

MINERAL ZONE (Elk City)—Work on removal of 3-stamp mill from Elk City Reduction Co.'s plant to this property is nearly completed and erection of mill on new site is well under way.

Shoshone County

GUELPH (Wallace)—A 200-ft. shaft will be sunk on this property, which lies north of Hercules. Compressor has been installed and hoist ordered.

EAST CALEDONIA (Wardner)—Has made promising strike in drift on 200 level, where two shifts are driving. Mine has recently been cleared of debt and is said to be in shape financially for considerable further development.

KILL BUCK (Wallace)—Constructing electric-power line to compressor at portal of Vulcan tunnel and will start driving for Kill Buck vein as soon as power is available. Vulcan tunnel is in 3500 ft. and has about 400 ft. to go to reach vein.

IMPERIAL (Wallace)—Directors of this company have inspected mine and announce that work will be resumed. Winze will be sunk on promising oreshoot in upper tunnel and crosscut will be driven from lower tunnel to prospect body of ore discovered by diamond drilling.

COPPER PRINCE M. & M. CO. (Wallace)—Capital stock of this company has been reduced from 4,000,000 shares to 400,000, par value $1. On Copper Prince claim winze is sinking from 500-ft. adit. On Gold Ridge claim three crosscuts show ore in vein. Property is equipped with compressor and air drills. Samuel B. Holbert is president and general manager.

FRISCO (Wallace)—This mine, now owned by Federal M. and S. Co., has been started up after short shut-down for purpose of making alterations in mill. Mine was reopened to recover zinc ore left in old workings but exploration at depth has proved large quantities of ore carrying lead and zinc. Owing to difficulty of separating lead and zinc, recovery at 400-ton mill has never been satisfactory.

MICHIGAN

Copper

ESTIMATED PRODUCTION OF LAKE SUPERIOR COPPER MINES for the month of September, based on rock tonnage and known averages of refined copper is as follows: Tamarack, 561,000 lb.; Osceola Consolidated, 1,755,000; Ahmeek, 2,225,000; Wolverine, 711,000; Mohawk, 1,359,000; Franklin, 381,600; Centennial, 53,000; Allouez, 848,000; Mass, 486,000; Superior, 326,000; Hancock, 159,800; La Salle, 177,000; South Lake, 21,600; Isle Royale, 900,000; Copper Range Consolidated, 4,600,000; Quincy, 2,000,000; Calumet & Hecla, 6,500,000; White Pine, 491,000; Lake, 280,000; Winona, 230,000.

WHITE PINE EXTENSION (White Pine)—Management, both in Michigan and in east, will be in hands of Stanton interests who became associated with Smith interests some months ago. Frank Stanton will arrive in few days to visit other mines of Stanton interests in this district and likewise to go over work already done at White Pine Extension and to map out plans for future.

OSCEOLA CONSOLIDATED (Osceola)—Average rock for all mines in this corporation for September ran close to 14 lb. Old Osceola shipped 24,000 tons and Kearsarge branches 99,000. No. 3 shaft, old mine, goes into commission this week, adding to low-grade rock tonnage. Shaft has been repaired and cleaned down to 8th level. Rockhouse equipment is permanent and in good condition.

Iron

OHIO (Michigamme)—Small pile of ore that has been in stock for years is now being shipped. No mining is being done.

MINNESOTA

Mesabi Range

WEBB (Hibbing)—Mine will be reopened within few days. Has been idle for two years. Mining will continue all winter. It is large underground property. Employs between 400 and 500 men when working full force.

LA RUE (Nashwauk)—M. A. Hanna Co. has reopened this mine. One hundred men have been given employment. One shovel is working two shifts. Pipe line five miles in length is being built from O'Brien Lake to the washing plant. Fifty cars of ore will be shipped daily until end of season.

QUINN-HARRISON (Nashwauk)—Five shovels and three merry-go-rounds are working days in pits. All five shovels are working nights. Rapid progress is being made with stripping. Washing plant is now working one shift. About 30 cars of wash ore are shipped daily. About 85 cars of merchantable ore are going direct from pit. Machine shop 200x50 ft. is to be erected. An addition is being made to office.

MISSOURI—KANSAS

VAN BIBBER & CO. (Joplin, Mo.)—Has made strike on Block City land, west of Joplin. Encountered run at 127-ft. level, and now has 12-ft. face of 15% ore and is still sinking in good ore.

JUMBO MINING (Alba, Mo.)—Fire of unknown origin destroyed concentrating plant of Company northeast of Alba. Cost of plant $25,000; insurance about $7,500. Property owned by Carthage men. Mill had been running about 1½ years.

STANLEY MINES (Galena, Kan.)—John McLaren and associates have taken lease of 40 acres on what is known as Stanley mines, and are installing pumps and 60-hp. gas engine. Expect to have machinery in place in about three weeks and have water out in from six to eight weeks. This tract of land was formerly owned by Ex-Vice-President Adlai Stephenson, of Bloomington, Ill. Was formerly large producer, but has been idle for several years.

MONTANA

Silver Bow County

ANACONDA (Butte)—Has completed installation of surface plant at Emma mine, of Butte Copper and Zinc Co., taken over under lease and bond recently. Pumping will be started in few days and as soon as water is out of mine sinking and mining will be started.

BUTTE & LONDON (Butte)—Cole-Congdon interests are also about to start sinking in Butte & London; big electric pump having been installed at station on 1,100. Water is practically all out of mine, and sinking will be started at once to depth of 1,000 ft., at which point entire ground of company will be crosscut and explored both north and south.

RAINBOW DEVELOPMENT (Butte)—Shaft has reached depth of more than 1,450 ft., and station will be cut at 1,500. After station and sump are completed company will crosscut to big Rainbow lead, according to present intentions. It is anticipated that ore will be found in vein at that depth, but if it is not of commercial character shaft will be sunk deeper.

DAVIS-DALY (Butte)—Is developing Hesperus vein, which has been opened on 2,500-ft. level distance of 150 ft. In all that distance vein is about 12 ft. wide, containing 4½ to 5 ft. of commercial ore well sprinkled with copper glance, bringing average grade up to 5½% copper. Colorado is so poorly ventilated that work on 2,500 level is slow. New orebody has appearance of permanency.

NEVADA

Clark County

BULLION (Goodsprings)—New dry-concentrating plant has been in operation for last few weeks, successfully treating low-grade lead ore. Plant has a capacity of 50 tons per day and uses Stebbins dry-concentrating tables.

ANCHOR (Goodsprings)—New dry-concentrating mill is nearing completion. R. W. Moore is in charge of property. Mill was designed and erected by Otto Wartenweiler, of Los Angeles. Plant will use crusher, rolls and Stebbins' tables, and will be of 50-tons capacity.

YELLOW PINE (Goodsprings)—Mill is operating two shifts daily, producing full contractual allowance of 1,500 tons zinc-carbonate ore monthly, also 200 tons of lead concentrate. A dividend of 10c. per share, amounting to a total of $100,000, has been declared, making total of $230,000 paid by this company during current year.

Esmeralda County

CHAMP D'OR FRENCH GOLD (Hornsilver)—William Dunphy lease on Orleans group now shipping 25 tons of $35 ore per day. Haul 16 mi. to railroad is done by autotrucks at contract price of 20c. per ton-mile.

GOLDFIELD CON. (Goldfield)—Estimated production for month of September, 1915, is: Total tons mined, 32,500; gross extraction, $269,000; operating expense, $159,000; net realization, $110,000.

JUMBO EX. (Goldfield)—Production approximately 80 tons of $45 ore per day. No. 2 shaft, a three-compartment shaft on the Velvet claim, projected to 1,000-ft. level to facilitate operations in present workings and development of northern portion of ground, now down 525 ft.

Nye County

TONOPAH ORE PRODUCTION for week ended Oct. 2 amounted to 9,496 tons, valued at $196,888, compared to 9,629 tons week previous. Producers were Tonopah Belmont, 2,756 tons; Tonopah Mining, 2,800; Tonopah Extension, 1,850; West End, 851; Jim Butler, 1,100; and miscellaneous leasers 139 tons.

ROUND MOUNTAIN MINING (Round Mountain)—Hydraulicking suspended Sept. 1 on account of lack of water. Now cleaning bedrock and preparing races for next season's run, which begins about March. Cleanup so far indicates value of about $2 per yd. for gravel handled this season.

Storey County

COMSTOCK PUMPING ASSN. (Virginia)—Repairing and equipping main south drift from Ophir-Mexican winze on 2,700 level.

UNION CON. (Virginia)—Saved from No. 1 stope north drift 36 cars of ore, averaging $17.10 per ton; from No. 2 stope southwest drift, 8 cars, averaging $15.73 per ton; from stope No. 3, near Sierra Nevada line, 86 cars, assaying $21.67 per ton.

MEXICAN (Virginia)—On 2,500 level started southwest drift from south drift No. 3, showing 3 ft. of quartz of low assay. East crosscut No. 3, 2,700 level, shows porphyry and stringers of quartz. Mill crushed 248 tons of ore, assaying $9.66 per ton.

CROWN POINT-BELCHER (Gold Hill)—Water 6 ft. below 1,600 station of joint incline; 1,600 level drained; repairs started in east crosscut. Saved 11 cars mill rock from Belcher 1,300 raise. Jacket mill received 966 tons of dump rock.

CON. VIRGINIA AND OPHIR (Virginia)—Equipment and winze between 2,500 and 2,700 levels completed. Small station cut on 2,700 level for starting west crosscut. Ophir discontinued raise on vein from 2,500 level southwest drift; prospecting vein below sill floor. Central tunnel extended north drift on 2,500 level distance of 12 ft.; 6 to 8 ft. of quartz assaying $5 to $11 per ton. Extracted 310 cars of ore and milled 220 tons.

NEW MEXICO

Grant County

HARDSCRABBLE (Pinos Altos)—Lease has been granted on property and several shafts will be opened up. Property has been offered for sale.

EMPIRE ZINC (Hanover)—Company has practically completed erection and installation of machinery at new powerhouse. Will generate electricity for mines and mill soon to be constructed.

85 MINING (Lordsburg)—Company has bought Atwood mine from Atwood Copper Co. Consideration reported in neighborhood of $100,000. Diamond-drill work now being done on Atwood. The 85 Mining Company now controls most important property in Virginia District. During month of September 232 carloads of ore were shipped from camp.

Lincoln County

ROBERTS MINES (Oscura)—Mines of D. W. Roberts have been leased to A. Chavez. Leaser has commenced work on property.

NAYLOR MINES (Tularosa)—Bismuth is being mined in San Andres mountains by Joe Naylor. Payment of 75c. per lb being received.

Luna County

ROYAL JOHN MINING CO. (Deming)—Company has filed articles of incorporation. J. C. Watson, agent. Capital $250,000. Mines are at Lake Valley, N. M.

AMERICAN SPELTER CO. (Deming)—Company is being incorporated by J. S. Vaught and D. S. Robins, of Deming, N. M. Will do general mining and milling.

SADDLER MINE (Cook's Peak)—Messrs. Hohlmeyer and Gunther, of El Paso, have bought mine from G. M. Sadler and W. O. Grace. Zinc ore will be shipped to Oklahoma from Spaulding Siding.

Santa Fé County

SANTA FE GOLD AND COPPER (San Pedro)—Company produced 289,766 lb. copper in August. $74,130 profits reported for past quarter.

Taos County

MEMPHIS RED RIVER MINING (Red River)—Mill and machinery of Trinidad Mine and Milling Co. acquired by company. Plant being put in condition for operation.

TEXAS

Culberson County

GEORGE A. PLUMMER (Port Arthur)—Plans to install large plant for extracting and refining sulphur from big deposit situated in northern part of Culberson County. Proposed improvements will cost about $370,000, it is stated.

UTAH

Beaver County

CREOLE MINING (Milford)—Articles of incorporation for this company were filed Oct. 4. Capitalization is 1,000,000 shares, par value 10c. on 600,000 shares issued. Norman W. Maire is president. Several hundred tons of copper ore are said to be exposed. Further development and shipments are to be started in near future.

Juab County

TINTIC ORE PRODUCTION for month of September amounted to 506 carloads, estimated at 25,300 tons, valued at $630,000. This compares with 648 carloads in August and 817 in July. The producers for month of September, 27 in number, were as follows: Chief Consolidated, 107 cars; Iron Blossom, 78 cars; Centennial Eureka, 78 cars; Mammoth, 52 cars; Eagle & Blue Bell, 48 cars; Gemini, 29 cars; Grand Central, 17 cars; Dragon Consolidated, 16 cars; Gold Chain, 11 cars; May Day, 11 cars; Beck Tunnel, 11 cars; Sioux mill dump, 10 cars; Victoria, 7 cars; Lower Mammoth, 6 cars; Beck Tunnel, 6 cars; Colorado, 3 cars; Carisa lease, 3 cars; Uncle Sam, 3 cars; Minnie Moore lease, 2 cars; Opohongo, 1 car; Eureka Hill, 1 car; Ridge & Valley, 1 car; Tintic Standard, 1 car; Utah Consolidated lease, 1 car; Cliff lease, 1 car; Utah Mining concentrates, 1 car; Utah ore sampler, 1 car.

KNIGHT-DERN MILL (Silver City)—It is understood that this plant will treat large tailings dump at Eureka Hill.

RIDGE & VALLEY (Eureka)—Since lowering of water level to 1,700, work has been done between that level and 1,600. Ore carries lead, silver, copper and gold. On 1,600 and 1,500 levels development work is being done toward north.

GEMINI (Eureka)—Leasers shipped 150 tons of ore in September. New work is being done on company account on lower levels, where water has recently been lowered to 1,700 level. This will allow development of orebodies, opened some time ago, and later covered by water.

CHIEF CONSOLIDATED (Eureka)—Good progress is being made in building new wagon-road between Scotia mine under lease and bond to this company, and loading station at Jericho on S. P. L. A. & S. L. R.R. Ore will be hauled by traction engine, capacity being 15 tons per trip.

Salt Lake City

UTAH COPPER (Bingham)—The August production was the largest in the history of the company, amounting to 15,966,543 lb.; 9 steam shovels are being worked on ore, and 11 shovels on stripping and waste; 30,000 tons of ore are being mined daily, and the shovels on waste are handling more material proportionally, per shovel.

Summit County

PARK CITY ORE PRODUCTION for month of September amounted to 7,835 tons, valued at $313,400. Shipments made by the principal mines in September were as follows, according to weekly shipment records: Silver King Coalition, 2,960 tons; Daly-Judge, 2,000 tons; Silver King Consolidated, 1,333 tons; Daly West, 945 tons; Ontario, 52 tons; D. W. Quincy, 45 tons; others (estimated) 500 tons.

NAILDRIVER (Park City)—Work is to be started at this property in eastern part of camp.

WISCONSIN

Ashland County

SOO LINE (Ashland)—New concrete-steel dock is to be erected at Ashland, to replace wooden structure that is in bad shape. Work will be started as soon as navigation closes. It will cost about $3,000,000 and will be one of largest docks at the head of Lake Superior. Old dock will be torn down. Work will be rushed with all possible speed in order that there will be no loss of time in spring. Soo line will handle over 1,000,000 tons from Gogebic range this year.

Zinc-Lead District

VINEGAR HILL ZINC (Platteville)—Site has been staked out for new mill equipment on Graham land at Millbrig.

FRONTIER (Galena, Ill.)—This company has started shaft sinking and will assemble Baxter mill equipment on the Treganza property just west of Benton.

UTT-THORNE (Platteville)—Rich strike of high-grade zinc ore has been made by churn drill ahead of Lawrence mine on Lawrence land northeast of Cuba City.

WISCONSIN ZINC CO. (Platteville)—Steel construction work on new 75x100 roaster at New Diggings has been completed. Skinner type of roaster and Cleveland-Knowles separating machines will be used. Shaft sinking has been begun on C. A. Thompson land and shafts will be started soon on Longhorn and Birkbeck leases which have been proven by churn drill.

CANADA

British Columbia

RAMBLER-CARIBOO (Three Forks)—After suspension of payment for about 12 years, will resume dividend disbursements Oct. 15, when 1c. per share will be distributed. Second payment of equal amount will be made Dec. 15. Total of two payments will be $38,500.

Ontario

DOME (South Porcupine)—Monthly statement for September shows bullion production of approximately $139,000 making new high record. Tonnage treated was 28,500 of average value of $4.87 per ton.

DOMINION REDUCTION (Boston Creek)—This company is operating property adjoining Papapassmakes claims, on which there is an orebody 10 to 15 ft. wide in places carrying low gold content. Putting down a 200-ft. shaft.

KENZIE (Boston Creek)—This property, one of claims controlled by John Papapassmakes, has been worked all season. Vein having paystreak 12 in. wide rich in free gold is being developed. It has been stripped for 450 ft. and two shafts are being put down.

MUNRO CONSOLIDATED (Munro Township)—This company recently organized owns six claims, operations on which are in charge of George Leyson. Sinking has been begun on vein carrying free gold, which was 4 in. wide at surface and at 70-ft. level had widened to 14 in.

HOLLINGER (Timmins)—Regular 4-weekly statement for period ended Sept. 9 shows gross profits of $149,936 from treatment of 28,172 tons of ore of average value of $9.03 per ton. Working costs $3.17 per ton. Mill also treated 11,559 tons ore from Acme mine. Total surplus on hand was $1,331,461.

Quebec

A DISCOVERY OF MOLYBDENUM is reported by J. D. Kennedy, of Sherbrooke, Que., on the river Metabetchasuan, near Chambord. The property is crossed by the Canadian Northern Ry. and offers good facilities for transportation.

CANADIAN CHINA CLAY (Huberdeau)—Kaolin property and plant at Huberdeau have been closed down for winter. It is expected that railway will be built to property by spring and in meantime additions and alterations will be made to plant to permit of steady output.

MEXICO

Sonora

THE ORE SHIPPED FROM MEXICO through the port of Agua Prieta for the month of September was as follows; from Nacozari, 7,736 tons; Montecristo, 22; La Caridad, 24; La Bellota, 101; Minnesota, 111; Crestoncita, 31; San Ygnacio, 55; Archipelago, 14; Belen, 22; Silver Snake, 23; Cobre Parado, 36; Palacio de Hierro, 18; Los Metalles, 16; Maria, 5; Santa Maria, 32; Rosario, 6; Mexico, 37; San Pablo, 50; La Coqueta, 68; San Jose, 47; Esperanza, 20; La Cruz, 14; El Tigre, 257. Total, 8545 tons. El Tigre also shipped 100 sacks of silver and gold precipitates weighing 19,459 lb. and 99 bars of silver and gold bullion weighing 18,205 lb. Estimated value of shipments in Mexican gold, or at the rate of 2 for 1 American dollar is, copper, $1,876,500; silver, $410,800; gold, $264,300; total, $2,551,600.

MONTECRISTO SONORA MINING (Moctezuma)—Thirty tons of ore that will average nearly 300 oz. silver have been shipped to Douglas smelters.

ARCHIPELAGO (Cumpas)—Three feet of 15% copper ore have been exposed in cleaning up old workings and men are now at work breaking ore. About three tons daily are being shipped from mine and dump.

NACOZARI CONSOLIDATED COPPER (Nacozari)—New body of ore has been encountered in what is thought to be ancient Spanish workings. Ore is silver glance and native silver. First car of concentrates shipped since railroad has been re-opened between Nacozari and Douglas netted $2,356.

AFRICA

Rhodesia

THE GOLD OUTPUT OF RHODESIA in August was 82,545 oz., being 1,876 oz. more than in July. This brings the production for the eight months ended Aug. 31 up to a total of 601,954 oz., or $12,442,389. Other production in August was 16,830 oz. silver, 321 tons copper, 3 tons lead, 26 tons asbestos, 4,271 tons chrome ore and 38,143 tons coal.

The Market Report

Metal Markets

NEW YORK—Oct. 13

All of the principal markets were quiet during the last week without material change in prices. Copper and spelter exhibited drooping tendencies, while lead was a little stronger in tone.

Copper, Tin, Lead and Zinc

Copper—The outstanding feature of the last week was the continued pressure to sell Lake copper which was offered on even terms with electrolytic. The domestic demand was light. The relatively small business reported was done at 17.82½@17.87½c., regular terms, delivered in Connecticut. Some half-million and million-pound lots were sold on that basis, the deliveries being for November and December. Copper for any delivery was available in large quantity at the same price.

There was a good demand for copper from Europe and excellent prices could be realized by anybody who could find the freight room. The deficiency of the latter continued to be an obstacle to this business.

The domestic consumption of copper appears to be improving, this being indicated by the inquiries from concerns that have nothing to do with the ammunition business.

Copper Sheets are quoted about 23c. per lb. for hot rolled and 24c. for cold rolled, with usual extras. Wire prices are unsettled; quotations may be put at 19½@19¾c. per lb. at mill. The chief maker does not quote base price.

Imports of Copper for the week ended Sept. 25 as reported by the Department of Commerce were 3,706,464 lb. metal and 3,089,314 lb. in ore and matte; 6,795,778 lb. in all. The chief imports were from Peru, Cuba, Canada and Chile. Exports for the week were 8,273,626 lb., the chief items being 5,257,786 lb. to France, 1,368,899 lb. to England and 1,273,266 lb. to Italy.

Visible Stocks of Copper in Europe on Sept. 30 are reported as follows: Great Britain, 20,995; France, 4,163; afloat from Chile, 825; afloat from Australia, 3,000; total, 28,983 long tons, or 64,921,920 lb. This is a decrease of 3,169 tons from the Sept. 15 report.

Tin—This market was dull and quiet, the price sagging off when the excitement over the prospective British export duty waned. The New York Metal Exchange on Oct. 8 passed a resolution to the effect that its existing form of contract was clear upon the point that any such duty that might be levied must be paid by the buyer. Nothing more definite respecting the imposition of such a duty appears yet to be known.

Tin production of the Federated Malay States eight months ended Aug. 31 was 33,075 long tons in 1914, and 30,908 tons in 1915; decrease, 2,167 tons.

Visible Stocks of Tin on Sept. 30 were: Great Britain, 5,120; Holland, 5; United States, excluding Pacific ports, 10,066; total, 15,191 long tons, an increase of 64 tons during September. The figures include 6,968 tons afloat.

Shipments of tinplates from the United States to Great Britain are unusual. Shipments from Baltimore for the past week, however, included 2,476,768 lb. tinplates to Glasgow.

Lead—This market stiffened upon the appearance of some fairly large orders from abroad which developed into business. The quotations at St. Louis improved a little, but in New York business was done at the old price, at which supplies of lead appeared to be freely available.

Spelter—This market dropped right through the week, there being no general demand worth mentioning from domestic consumers. On the other hand, the big demand from Europe continued and many thousands of tons were sold for export far ahead, most of the principal producers participating in this business. These contracts were made generally to run through long periods, beginning in October or November, and running to March or April. The stock of spelter available for immediate delivery appears to be increasing, but smelters are naturally more interested in selling their prompt supplies in conjunction with distant futures than they are in selling for early months alone. The demand for early spelter is, however, so light, that producers who are willing to sell in that way have been obliged to offer the metal down and toward the close of the week prompt spelter was liberally offered at 13c., with the probability that any firm bids of 12¾c. would be snapped up. As has been noted above, the bulk of the transactions were for export, on long-running terms. One large domestic contract, on such terms, was reported, but this appeared to be an isolated transaction, the domestic interest having by no means been general. The galvanizers continued to be conspicuous by their absence.

Zinc Sheets—Business has been active, sales good but with no material change in quotations. The base price for carload lots is $16 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

In this table of prices the figure for sterling exchange of Sept. 22 was given at 4.470, through a typographical error. The correct figure was 4.700 for that date.

DAILY PRICES OF METALS IN NEW YORK

Oct.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc
			Electrolytic, Cts. per Lb.	Spot, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	St. Louis, Cts. per Lb.
7	4.7050	49¼	17.65 @17.75	32½	4.50	4.37½ @4.42½	11.50 @13.50
8	4.6975	49⅝	17.62½ @17.67½	32½	4.50	4.37½ @4.42½	11.25 @13.25
9	4.6938	49½	17.62½ @17.67½	32⅜	4.50	4.37½ @4.42½	11.25 @13.25
11	4.6775	49½	17.62½ @17.67½	32¾	4.50	4.40 @4.42½	11.00 @13.00
12	.....	...	.....	...	....	4.40 @4.45	10.50 @13.00
13	4.6725	49½	17.62½ @17.67½	32½	4.50	4.40 @4.45	10.50 @13.00

The quotations herein are our appraisal of the average markets for copper, lead, spelter and tin based on wholesale contracts for the ordinary deliveries of the trade as made by producers and agencies; and represent, to the best of our judgment, the prevailing values of the metals, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.17c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumers and is subject to discounts, etc. The price quoted for copper on "regular terms" is the gross price including freight to the buyer's works and is subject to a discount for cash. The difference between the price delivered and the New York cash equivalent is at present about 0.20c. on domestic business. The price of electrolytic cathodes is 0.05 to 0.10c. below that of electrolytic. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Prime Western brands. Only the St. Louis price is herein quoted, St. Louis being the basing market. We quote the New York price at 17c. per 100 lb. above the St. Louis price.

Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1c.

LONDON

Oct.	Silver	Copper				Tin		Lead		Zinc	
		Standard		Electrolytic							
		Spot	3 Mos.	£ per Ton	Cts. per Lb.	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
7	23 1/16	72	73	88	18.48	149¼	150⅜	23⅛	4.96	69	14.56
8	23 1/16	72¼	73	88	18.45	149½	150¾	23⅛	4.95	68¾	14.29
9	23⅛	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	23 1/16	72⅛	73⅛	88	18.37	149¼	150⅜	23 1/16	4.96	64¼	13.50
12	24	74	74½	88	18.37	149¼	150½	23⅜	4.95	63½	13.25
13	24	73⅛	74	88	18.35	149	150½	23⅛	4.92	64¼	13.49

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for electrolytic, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at 4.80. £15 = 3.21c.; £20 = 4.29c.; £30 = 6.43c.; £40 = 8.57c.; £60 = 12.85c. Variations, £1 = 0.21⅜c.

Other Metals

Aluminum—The scarcity of metal for early delivery is still the main feature in the market. For such deliveries prices are firmer and as high as 55@57c. per lb. has been paid for No. 1 ingots. For futures no quotations are available.

Antimony—Business has been rather more active, with some fair-sized transactions. Prices remain about the same, 28@29c. per lb. for Chinese and other ordinary brands; 45@46c. per lb. for Cookson's. A large shipment of Chinese metal is held up by the trouble in the Panama Canal.

Nickel—Quotations for ordinary forms are nominally 45@50c. per lb., according to size and terms of order. A premium of 3c. per lb. is charged for electrolytic nickel.

Quicksilver—The market has been active and is strong, on account of the scarcity of stocks, which are very low. In New York quotations are $92@94 per flask of 75 lb. for both large and small orders. San Francisco reports by telegraph quotations $87.50@92 per flask, with brisk demand and stocks low. London price is lower, £15 10s. per flask, with no discount from second hands.

Gold, Silver and Platinum

NEW YORK—Oct. 13

Gold receipts of $6,000,000 from Australia at San Francisco are reported this week.

Platinum—The market continues uncertain and no new supplies have been received. Prices remain high, and we quote $51@55 per oz. for refined platinum, and $55@59 per oz. for hard metal.

Our Russian correspondent writes under date of Sept. 8 that the market has shown an extraordinary increase in activity and prices. This has been mainly due to the scarcity of foreign bills and the high rates of exchange. In Petrograd these rates have stood as high as 14 rubles to £1 and 3 rubles to $1—the normal rates being 9.40 and 1.94 rubles. Speculators have bought large quantities of platinum for export to secure the bills, which can be sold on the Stock Exchange at a high profit. The advance has been as much as 6,000 rubles per pood. The current quotations for crude metal, 83% platinum, are 10@10.50 rubles per zolotnik at Ekaterinburg; 38,000@40,000 rubles per pood at Petrograd; equal to $38.54 and $38.22 per oz., average.

Silver—The market continues steady with slightly upward trend, but the decline in sterling exchange has reduced the New York price from 49¾c. on Oct. 7 to 49½c. on Oct. 13.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Oct. 9

The base price paid this week for zinc ore was $76@80 per ton for 60% grades; medium grades sold at a base price of $72@75 per ton. The base price paid for 80% lead ore was $53@55 per ton. The shipment this week was the largest on record for the Wisconsin District. The net tonnage of zinc ore for the first nine months of 1915 exceeded the figures for the corresponding period of last year by 31,539,810 lb.

SHIPMENTS, WEEK ENDED OCT. 9

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	4,643,370	214,500	620,580
Year	152,849,410	4,996,120	21,114,770

Shipped during week to separating plants, 7,123,460 lb. zinc ore.

JOPLIN, MO.—Oct. 9

Blende, high price, $89.50; base per ton of 60% zinc, premium ore, $87.50; medium grades, $87@85; lower, $84@80; calamine base per ton, 40% zinc, carlots, $60; average, all grades of zinc, $81.99 per ton. Lead, high price, $56; base per ton 80% metal content, $55@50; average, all grades of lead, $50.53 per ton.

	Blende	Calamine	Lead	Values
Total this year...	444,689,820	33,707,780	69,506,010	$19,560,050
Total this week...	11,684,410	62,000	1,784,130	$526,640

Blende value, the week, $479,700; 41 weeks, $16,968,210.

Calamine value, the week, $1,860; 41 weeks, $768,920.

Lead value, the week, $45,080; 41 weeks, $1,822,920.

An entire week with very light rainfall encourages a belief that the excess is past and lends promise of a possible moderation for some time. Water is very heavy in the mines and the strain on pumping machinery causes frequent trouble, it is generally under control in all the large mines, but some small mines are still idle. The lighter shipment of this week added approximately 600 tons stock in the bins. Buying was lighter to the close, with a feeling among buyers of an easier market next week.

MONTANA ZINC ORE

In September the Butte & Superior mills treated 40,400 tons ore saving 11,600 tons concentrates, containing a little over 13,000,000 lb. zinc.

Iron Trade Review

NEW YORK—Oct. 13

Export orders continue large and domestic business is growing steadily. Structural work is the slowest end of the market, but is improving.

Orders for rails are coming in quite freely, and many companies are making up their orders for next year. More orders for cars are also noted.

Steel companies are rather holding back on orders for 1916 business, at any rate beyond the first quarter. Most of the mills are so full that they are not able to guarantee early deliveries. Price advances are being firmly held and some more are expected to be made before long.

Pig iron is in greater demand and quotations are firm, notwithstanding the increased production. It is to be noted that a good share of the larger make in September was from the steel works furnaces. There has been no considerable buying for next year thus far, and not much is expected this month.

The United States Steel Corporation reports unfilled orders on its books on Sept. 30 at 5,317,618 tons of material of all kinds. This is an increase of 409,163 tons over the statement for Aug. 31, and is the highest figure reported for many months.

Pig-Iron Production again increased in September. The reports of the furnaces, as collected and published by the "Iron Age," show that on Oct. 1 there were 268 coke and anthracite stacks in blast having a total daily capacity of 97,535 tons of iron; an increase of 6,460 tons over Sept. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in September was 2,882,500 long tons; for the nine months ended Sept. 30, it was 20,518,500 tons. Of this total 15,072,575 tons, or 73.5%, were made by furnaces owned and operated by the steel companies. Production in September was at the rate of about 35,000,000 tons a year.

PITTSBURGH—Oct. 12

Week by week the steel mills find themselves more oversold, with respect to deliveries they should be making currently, and with respect to specifications booked for forward shipment. In bars, plates and shapes specifications on open contracts are coming in so freely that Jan. 1 will probably find the large mills with specifications on books for three months of solid work. That will not mean that buyers will necessarily be inconvenienced through delay in delivery, as much of the tonnage now being specified is being placed because buyers realize the delivery will be slow. The condition greatly strengthens the market as the mills have little occasion to sell for first quarter, and prices are going up. With such slow deliveries the small mills, which do not sell ahead, are reaping a harvest on prompt business, at premium prices, as high as 1.60c. being paid for plates for early delivery. On bars, plates and shapes the large mills are generally quoting 1.40c. on specific orders for delivery at mill convenience, and 1.45c. on first-quarter contracts, in case they quote at all.

Sheets are stiffened rapidly, with 2.00c. as minimum on 28-gage black, for bessemer, and 2.05@2.10c. for openhearth, with no selling for first quarter, except specialties and at advanced prices. The wire mills have very little to offer in plain wire and in barb wire they are filled solidly for at least three months.

Railroads have already contracted for at least 400,000 tons of rails for next year, and they are eagerly buying plain steel and track material both for early and for extended delivery.

The scarcity of steel is due in large part to the war demand, which diverts much steel to forging shops and also curtails the supply available for finishing mills by the specifications requiring heavy cropping from the ingots, 30% very commonly.

It is now quite generally predicted that steel prices will advance more sharply in the next three months than they have in the past three, owing to the physical conditions as to demand and supply, coupled with the new idea among steel mills that little if anything is to be gained at this juncture by endeavoring to keep prices within bounds, when higher and higher prices are evidently to be obtained without difficulty.

Pig Iron—The market continues very quiet. Some of the merchant stacks that recently went into blast are but indifferently supplied with orders, even for early deliveries, and buyers show no anxiety about the future. Evidently they are convinced that whatever shortage there may be of steel there will be ample supplies of pig iron. With recent advances the less well positioned furnaces should be able to make profits, and there remain a fair number of merchant stacks idle. While Lake Superior ore is expected to be about 50c. higher for next season, and Connellsville coke has advanced somewhat, all the advances accomplished or in prospect in blast-furnace raw materials are covered by advances that have already occurred in pig iron. The foundries as a class are not really busy. If their condition should change materially for the better advances in pig iron might easily be resumed. We quote: Bessemer, $16; basic, $15; malleable, $14.50@15, according to analysis; No. 2 foundry, $14.50@15, according to delivery, all f.o.b. Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—The market continues rather uneventful, with foreign on contract quoted at $100, Baltimore, for indefinite delivery and domestic at $115, for assured delivery, prompt lots commanding intermediate prices.

Steel—The demand for special steel for forging shells and for rolling large rounds for shrapnel has taken up all available openhearth capacity, with an insistent demand left. Mills are securing $40@45 for billets for rolling shrapnel rounds, under special specifications that are not difficult and make very profitable business, to the entire neglect of ordinary soft-steel openhearth billets. There are occasional offerings of openhearth sheet bars, at $27@27.50, Pittsburgh. Consumers are likely to turn more to bessemer, which has lately been neglected. It is understood that occasional lots of bessemer might be obtained at $25@25.50. Youngstown, for billets and $25.50@26 for sheet bars. Rods are nominal at $31, Pittsburgh.

FERRO-ALLOYS

Ferromanganese is quoted at $110@$115 per ton for domestic 80% material. **Spiegeleisen** has been sold at $27 per ton for 20%, at furnace.—**Ferrosilicon,** 50%, is quoted at $75 per ton at Pittsburgh. Bessemer ferrosilicon is from $20 per ton for 10% up to $24 for 14%, all at furnace.—**Ferrotitanium** is 8@12½c. per lb., according to size of lots and delivery.—**Ferrovanadium** is $2@2.25 per lb. of contained vanadium.—**Ferrotungsten** is quoted in London at 7s.@7s. 6d. per lb.—$1.68@1.80—for alloy 75@80% tungsten.—**Ferromolybdenum** is quoted in London at 18s.—$4.32—per lb. for 75% alloy.

IRON ORE

Shipments of iron ore from the Lake Superior regions in September were 7,863,146 long tons, the heaviest September shipments on record. For the season to Oct. 1 the total shipments were, in long tons:

Port.	1914	1915	Changes
Escanaba	3,019,651	4,011,682	I. 992,031
Marquette	1,385,718	2,313,532	I. 927,815
Ashland	2,741,917	3,829,582	I. 1,087,665
Superior	9,478,253	5,997,023	D. 3,481,230
Duluth	5,278,899	11,807,219	I. 6,528,320
Two Harbors	4,804,975	6,710,528	I. 1,905,553
Total	26,709,413	34,669,566	I. 7,960,153

Shipments from Superior decreased on account of the light work this year on the Hill ore lands.

Some additional sales of Lake ore for this season's delivery are reported, a furnace company in the Mahoning Valley having taken 100,000 tons. October shipments are being rushed. A severe storm on the Lakes delayed shipping last week.

The total iron ore mined in New Jersey in 1914 is reported by the State Geological Survey at 350,135 long tons. The quantity sold was 346,820 tons.

OTHER ORES

All production of molybdenite, of wolfram ore and of scheelite in Australia has been requisitioned by the Commonwealth. The prices fixed for molybdenite are 105s.—$25.20—per unit for molybdenite and 55s.—$13.20—per unit for wolfram or tungsten ore. Australia supplies a considerable part of the demand for these ores. Burma is also a considerable producer.

Molybdenite, 90% MoS_2 is quoted in London at 120s.—$28.80—per unit.—**Tungsten** ore is high, wolfram, 65% WO_3 being quoted at 55s.—$13.20—per unit.

COKE

Coke production for the week in the Connellsville region is reported by the "Courier" at 397,589 tons. Shipments, 395,243 short tons. Production of Greensburg and Upper Connellsville districts, 44,715 tons. The "Courier" states the Connellsville production for the third quarter at 4,063,814 short tons; for the nine months ended Sept. 30, at 12,300,358 tons.

Anthracite shipments in September are reported at 5,378,771 long tons. For the nine months ended Sept. 30 the total shipments were 50,067,581 tons in 1914, and 47,379,111 tons in 1915; a decrease of 2,688,470 tons, or 5.8%, this year.

Connellsville—Contracting for furnace coke for 1916 delivery is proceeding at a moderate pace, and at prices a shade lower than operators expected a month ago they would be able to obtain. Contracts closed thus far on the movement amount to between 125,000 and 150,000 tons a month, somewhat more than half being for the full year rather than the half year, buyers being tempted by the fact that operators will sell at as low a price for the year as for the half year, and sometimes at a shade lower. One contract recently made at $2.35 for six months has been revised, at the request of the buyer, at $2.25 for the entire year, the operator being well satisfied to make the change, and these prices represent the markte quite closely. Operators are more inclined to sell at such flat prices than on the sliding-scale basis, which generally gives $2.25 coke on $15.50 pig iron, $2.35 on $16 pig iron and so on, when the market basis now is only $15, making a settling basis for coke at $2.15. Spot furnace coke has stiffened fully 5c. and is now quotable at $1.85@1.90. Foundry is quotable $2.30@2.60 for prompt and $2.40@2.60 on contract.

Fuel Exports of Great Britain eight months ended Aug. 31, in long tons:

	1914	1915	Changes
Coal	44,257,161	29,522,179	D. 14,734,982
Coke	694,061	576,218	D. 117,843
Briquettes	1,324,937	864,503	D. 460,434
Steamer coal	13,249,027	9,657,927	D. 3,591,100
Total	59,525,186	40,620,827	D. 18,904,359

Steamer coal is that furnished to steamships in foreign trade. The heavy decrease shown this year is due to the war conditions.

Chemicals

NEW YORK—Oct. 13

The general markets show little change, but there is a slight gain in business in several lines.

Arsenic—The market is quiet and rather dull. Prices are unchanged. Quotations are $3.50 per 100 lb. for large lots, and up to $4 for smaller orders.

Copper Sulphate—Business is steady and no change can be reported. Quotations are $6.75 per 100 lb. for carload lots and $7 per 100 lb. for smaller orders.

Nitrate of Soda—The market for this article continues strong and business has been on a fair scale. Prices are firm and 2.45c. per lb. is bid for both spot and futures.

Production in Chile is improving and is expected to increase still further. That for August was 4,961,580 quintals, or 23,125 tons.

Pyrites—Arrivals at Baltimore for the week included 5,822 tons of pyrites from Huelva, Spain.

Imports and Exports of Fertilizing Chemicals in the United States, seven months ended July 31, in long tons:

	Imports		Exports	
	1914	1915	1914	1915
Kainit	291,878	6,646	.....	.....
Manure salts	135,422	13,647	.....	.....
Other potash salts	170,061	66,821	2,228	900
Nitrate of soda	341,480	436,944	5,862	12,771
Sulphate of ammonia	45,383	23,519	.....	1,186
Phosphates	.....	.....	878,147	111,703

Exports include reëxports of foreign material. Some phosphates are imported, but are not reported separately in the returns.

Imports and Exports of Raw Material for Chemical Manufacture, seven months ended July 31, in long tons:

	Imports		Exports	
	1914	1915	1914	1915
Sulphur	9,432	13,121	81,260	7,550
Pyrites	577,489	450,521	.....	.....
Chrome ore	42,071	18,555	.....	.....
Magnesite	82,731	16,911	1,016	390

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total imports of sulphur this year were 193,341 tons.

PETROLEUM

Exports of mineral oils from the United States in August were 232,224,014 gal. For the eight months ended Aug. 31 the total exports were 1,493,937,331 gal. in 1914, and 1,518,884,770 gal. in 1915; an increase of 24,947,439 gal., or 1.7%, this year.

Assessments

Company	Delinqc	Sale	Amt.
Aetna, Ida	Oct. 16	Nov. 15	0.001
Argenta, Ida	Oct. 11	Nov. 13	0.001
Buffalo, Mont	Sept. 10	Oct. 10	0.003
Cash Boy, Nev	Sept. 29	Oct. 30	0.01
Central Eureka, Calif	Oct. 8	Oct. 9	0.05
Coeur d'Alene Explor., Ida	Sept. 14	Oct. 14	0.002
Coeur d'Alene Inv., Ida	Oct. 25	Dec. 6	0.002
Columbus Ext., Utah	Oct. 10	Oct. 30	0.025
Comstock, Ida	Sept. 30	Oct. 30	0.001
Con. Virginia, Nev	Sept. 28	Oct. 19	0.05
Copper Mt. M. & D., Ida	Oct. 28	Dec. 1	0.002
Diam'field Black Butte, Nev.	Oct. 4	Nov. 4	0.01
Eagle Mt., Ida	Oct. 15	Nov. 15	0.0005
E. Hercules Ext., Ida. (post.)	.....	Oct. 11	0.0015
Enterprise, Ida	Oct. 15	Nov. 15	0.002
Exchequer, Nev	Oct. 4	Oct. 25	0.02
Four Timbers, Wash	Oct. 4	Nov. 4	0.001
Friend, Wash	Oct. 18	Nov. 10	0.002
Gethin Le Roy, Utah	Sept. 25	Oct. 13	0.01
Giant M. & D., Ida	Oct. 7	Nov. 8	0.003
Goldstrike M. & L., Utah	Oct. 1	Oct. 20	0.01
Great Bend Reinc., Nev	Sept, 10	Oct. 10	0.01
Hancock Cons., Mich	Jan. 3	.....	1.00
Idora, Ida	Oct. 11	Nov. 11	0.005
LeRoy, Ida	Sept. 25	Oct. 25	0.002
Lewis & Clark, Ida	Oct. 15	Nov. 15	0.001
M. & P. Gold, Utah	Sept. 15	Oct. 12	0.0 25
Mount Pleasant Con., Calif	.....	Oct. 7	0.08
Nabob, Ida	Oct. 25	Nov. 15	0.005
Nalldriver, Utah	Oct. 9	Nov. 8	0.02
Nevada Cooperative, Nev	Sept. 15	Oct. 15	0.01
Nevada-Douglas, Nev	Sept. 27	Oct. 20	0.10
New Arcadian, Mich	Dec. 1	.....	0.50
New Baltic, Mich	Jan. 15	.....	0.50
Northern Light, Ida	Nov. 2	Dec. 2	0.004
Ophir, Nev	Oct. 12	Nov. 2	0.05
Phedora, Ida	Sept. 21	Oct. 21	0.0005
Phoenix, Mich	Jan. 1	.....	1.00
Pioche Metals, Nev	Oct. 20	Nov. 20	0.00½
Rainbow, Ida	Oct. 15	Nov. 20	0.002
Revelator, Utah	Oct. 4	Oct. 25	0.00½
Rockford, Ida	Oct. 4	Oct. 30	0.005
Silver Moon, Ida	Oct. 15	Nov. 18	0.005
Silver Pick Cons., Nev	Oct. 16	Nov. 23	0.01
Snowstorm Ext	Sept. 16	Oct. 18	0.003
Sunset M. & D., Nev	Oct. 18	Nov. 22	0.02
Sunshine, Ida	Oct. 15	Nov. 15	0.0006
Temple, Ida	Sept. 20	Oct. 20	0.002
Union Cons., Nev	Oct. 25	Nov. 15	0.05
Wisconsin, Ida	Oct. 19	Nov. 19	0.003

Stock Quotations

Sales at auction: Boston, 21,146 Davis-Daly Copper, 1 1/16 to 1.20; Philadelphia, 23 Reading Iron Ore, $2 lot; 50 Nevada-Utah M. & S., par $10, $1 lot.

COLO. SPRINGS Oct. 11		SALT LAKE Oct. 7	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia	.02¼	Beck Tunnel	.06½
Cripple Cr'k Con.	‡ .008	Black Jack	.05
C. K. & N.	‡ .02	Colorado Mining	.06
Doctor Jack Pot	.09	Crown Point	.01⅛
Elkton Con.	.23½	Daly-Judge	6.65
El Paso	.70	Emma Cop.	.20½
Findlay	.03¼	Gold Chain	.16
Gold Dollar	.01	Grand Central	.50
Gold Sovereign	.08	Iron Blossom	.72
Golden Cycle	1.80	Lower Mammoth	.04
Isabella	.16½	May Day	.18
Jack Pot	.06½	Opohongo	.00½
Jerry Johnson	.04½	Prince Con	.55
Lexington	‡ .005	Seven Troughs	.01½
Mary McKinney	.35½	Silver King Coal'n	3.30
Pharmacist	.008	Silver King Con.	2.07½
Portland	1.60½	Sioux Con.	.02
Raven B. H.	.02	Uncle Sam	.08
Vindicator	1.50	Yankee	.42

TORONTO Oct. 4			
Bailey	.04½	Dome Exten.	.26
Chambers Feriand	.14	Dome Mines	21.75
Coniagas	4.00	Foley O'Brien	.30
Peterson Lake	.21	Hollinger	25.00
Right of Way	.03	Imperial	.05
Seneca Superior	‡ .78	Jupiter	.11
Silver Queen	.01	McIntyre	.47
T. & Hudson Bay	20 00	Pearl Lake	‡ .00½
Timiskaming	.38	Porcu. Crown	.75
Trethewey	.16	Preston E. D.	.04½
Wettlaufer-Lor.	.07	Rea	‡ .09

SAN FRANCISCO Oct. 11			
Comstock Stocks		Misc. Nev. & Ca	
Alta	‡ .05	Belmont	3.50
Andes	.09	Jim Butler	.75
Best & Belcher	.05	Lone Star	.04
Caledonia	.65	MacNamara	.02
Challenge Con.	‡ .04	Midway	.13
Chollar	.02	Mont.-Tonopah	.27
Confidence	.16	North Star	10.00
Con. Virginia	.16	Rescue Eula	.09
Gould & Curry	.03	West End Con.	.56
Hale & Norcross	.04	Atlanta	.27
Jacket-Cr. Pt.	.14	Booth	.42
Julia	‡ .03	C.O.D. Con.	.04
Mexican	.32	Comb. Frac.	.08
Occidental	.79	D'field Daisy	.03
Ophir	.20	Jumbo Extension	1.32½
Overman	.09	Pitts.-Silver Peak	‡ .06
Potosi	.03	Round Mountain	.40
Savage	.06	Sandstorm Kendall	.11
Sierra Nevada	.28	Silver Pick	.07
Union Con.	.55	Central Eureka	.04

N. Y. EXCH. Oct. 11		BOSTON EXCH Oct. 11	
Name of Comp.	Clg.	Name of Comp.	Clg.
Am.Sm.&Ref.,com	92	Adventure	2
Am. Sm. & Ref., pf.	109¾	Ahmeek	397
Am. Sm. Sec., pf. A	87	Alaska Gold M	34
Am. Sm. Sec., pf. B.	81½	Algomah	2½
Anaconda	76¾	Allouez	55
Batopilas Min.	1½	Am. Zinc	60¾
Bethlehem Steel	449	Ariz. Com., ctfs.	‡
Bethlehem Steel, pf.	165	Bonanza	.40
Chino	49⅞	Butte-Balakiava	3½
Colo. Fuel & Iron.	58¾	Butte & Superior	61
Crucible Steel	93⅝	Calumet & Ariz.	65
Federal M. & S., pf.	53	Calumet & Hecla	555
Great Nor., ore., ctf.	49½	Centennial	17½
Guggen. Exp.	68¾	Copper Range	58
Homestake	120	Daly West	2½
Inspiration Con.	45¾	East Butte	13½
International Nickel	221	Franklin	10
Miami Copper	35	Granby	86½
Nat'l Lead, com.	66½	Hancock	17
National Lead, pf.	110½	Hedley	‡27
Nev. Consol.	15⅞	Helvetia	.70
Ontario Min.	3½	Indiana	6
Quicksilver	2½	Island Cr'k, com.	45½
Ray Con.	27	Island Cr'k, pfd.	86½
Republic I&S, com.	52⅞	Isle Royale	30
Republic I&S, pf.	104	Keweenaw	2½
Sloss-Sheffl'd, com	60½	Lake	14½
Tennessee Copper	64	La Salle	5½
Utah Copper	71½	Mason Valley	2
U. S. Steel, com.	83	Mass	12
U. S. Steel, pf.	115	Mayflower	4½
		Michigan	2½
N. Y. CURB Oct. 11		Mohawk	79¾
Alaska Juneau	13	New Arcadian	11½
Alta Con.	.20	North Butte	32½
Beaver Con.	‡ .26	North Lake	1½
Big Four	.05	Ojibway	‡1½
Blue Bell	.02	Old Colony	4½
Braden Copper	9½	Old Dominion	54½
Buffalo Mines	⅜	Osceola	87½
Can. Cop. Corpn	‡⅛	Quincy	85
Cashboy	.05½	Santa Fe	3¼
Chile Cop.	22	Shannon	7
Con. Ariz. Sm.	1 5/16	Shattuck-Ariz.	27½
Con. Coppermines	11	Superior	29½
Con. Nev.-Utah	‡ .25	Superior & Bost.	2½
Dia. Black B.	.06	Tamarack	57
Florence	.45	Trinity	13½
Goldfield Con.	1⅜	Tuolumne	.50
Goldfield Merger	.19	U. S. Smelting	43¾
Greene Cananea	43	U. S. Smelt'g, pf.	46½
Kennecott Cop.	55	Utah Apex	3⅛
Kerr Lake	3¾	Utah Con.	12½
La Rose	.50	Victoria	3½
Magma	14½	Winona	3½
McKinley-Dar-Sa	.30	Wolverine	61½
Mines of Am.	2½	Wyandot	1½
Mother Lode	.36½		
Nevada Hills	.17	BOSTON CURB Oct. 11	
New Utah Binghan	3½	Bingham Mines	7½
Nipissing Mines	7	Boston Ely	.23
Oro	.07	Butte & Lon'n Dev.	.32
St. Joseph Lead	12½	Calaveras	1½
South Utah	.35	Calumet-Corbin	.02
Stand'd Oil of N.J.	488	Chief Con.	.93
Standard S. L.	1 9/16	Cortez	.42
Stewart	21/32	Crown Reserve	.35
Success	.90	Davis-Daly	1½
Tonopah	5 5/16	Eagle & Blue Bell	1½
Tonopah Ex.	2⅜	First Nat. Cop.	7
Tonopah Merger	.34	Houghton Copper	2½
Tribullion	5/16	Iron Cap Cop., pf.	5
Tularosa	‡⅛	Majestic	.70
Yukon Gold	2½	Mexican Metals	.24
		Nevada-Douglas	.75
LONDON Sept. 28		New Baltic	3½
Alaska Tre'dwell	£6 12s 6d	New Cornelia	9¼
Burma Corp.	1 11 6	Ohio Copper	.11
Cam & Motor	0 12 6	Oneco	.85
Camp Bird	0 5 0	Raven Copper	.10
El Oro	0 7 0	Rex Cons.	.51
Esperanza	0 7 0	Smokey Dev.	.15
Mexico Mines	3 12 6	So. Lake	6
Nechi, pfd.	0 13 0	Tonopah Victor	.25
Oroville	0 15 0	United Verde Ext.	5⅛
Santa Gert'dis	0 6 6	Utah Metal	7⅛
Tomboy	1 0 0		
Tough Oakes	0 7 3	‡Last Quotations.	

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1913	1914	1915	1913	1914	1915
January	62.938	57.572	48.855	28.983	26.553	22.731
February	61.642	57.506	48.477	28.357	26.573	22.753
March	57.870	58.067	50.241	26.669	26.788	23.708
April	59.493	58.519	50.250	27.416	26.958	23.709
May	60.361	58.175	49.915	27.825	26.704	23.570
June	58.990	56.471	49.034	27.199	25.948	23.267
July	58.721	54.678	47.519	27.074	25.219	22.597
August	59.293	54.344	47.163	27.335	25.979	22.780
September	60.640	53.290	48.680	27.986	24.260	23.591
October	60.793	50.654	.....	28.083	23.199	.....
November	58.995	49.082	.....	27.263	22.703	.....
December	57.760	49.375	.....	26.720	22.900	.....
Year	59.791	54.811	.....	27.576	25.314	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York Electrolytic		London Standard		London Electrolytic	
	1914	1915	1914	1915	1914	1915
January	14.223	13.641	64.304	60.756	69.488	65.719
February	14.491	14.394	65.259	63.494	70.188	*
March	14.131	14.787	64.276	66.152	69.170	*
April	14.211	16.811	64.747	75.096	69.313	*
May	13.996	18.506	63.182	77.600	67.786	*
June	13.603	19.477	61.336	82.574	66.274	95.333
July	13.223	18.796	60.540	76.011	64.955	91.409
August	*	16.941	‡	68.673	‡	82.333
September	*	17.502	‡	68.915	‡	85.250
October	*	.....	‡	.....	‡	.....
November	11.739	.....	53.227	.....	*	.....
December	12.801	.....	56.841	.....	*	.....
Year	.....	.....	.....	.....	.....	.....

TIN

Month	New York		London	
	1914	1915	1914	1915
January	37.779	34.260	171.905	156.550
February	39.830	37.415	181.556	176.925
March	38.038	48.426	173.619	180.141
April	36.154	47.884	163.963	166.225
May	33.360	38.790	150.702	162.675
June	30.577	40.288	138.321	167.636
July	31.707	37.423	142.517	167.080
August	*	34.389	‡	151.440
September	32.675	33.125	‡	152.625
October	30.284	.....	‡	.....
November	33.304	.....	149.391	.....
December	33.601	.....	147.102	.....
Av. year	.....	.....	.....	.....

LEAD

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	4.111	3.729	4.011	3.548	19.665	18.606
February	4.048	3.827	3 937	3.718	19.606	19.122
March	3.970	4.053	3.850	3.997	19.651	21.883
April	3.810	4.221	3.688	4.142	18.225	21.094
May	3.900	4.274	3.808	4.182	18.503	20.347
June	3.900	5.932	3.810	5.836	19.411	25.170
July	3.891	5.659	3.738	5.531	19.051	24.611
August	3.875	4.656	3.715	4.520	‡	21.946
September	3.828	4.610	3.658	4.490	‡	23.151
October	3.528	.....	3.384	.....	‡	.....
November	3.683	.....	3.585	.....	18.500	.....
December	3.800	.....	3.662	.....	19.097	.....
Year	3.862	.....	3.737	.....	.....	.....

SPELTER

Month	New York		St. Louis		London	
	1914	1915	1914	1915	1914	1915
January	5.262	6.386	5.112	6.211	21.533	30.844
February	5.377	8.436	5.228	8.255	21.413	39.819
March	5.250	8.541	5.100	8.366	21.460	44.141
April	5.113	10.012	4.963	9.837	21.569	49.888
May	5.074	14.781	4.924	14.610	21.393	68.100
June	5.000	21.208	4.850	21.038	21.345	100.614
July	4.920	19.026	4.770	18.856	21.568	97.250
August	5.568	12.781	5.418	12.611	‡	67.786
September	5.380	13.440	5.230	13.270	‡	67.841
October	4.909	.....	4.750	.....	‡	.....
November	5.112	.....	4.962	.....	25.016	.....
December	5.592	.....	5.430	.....	27.369	.....
Year	5.213	.....	5.06	.....	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton. * Not reported, ‡ London Exchange closed.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1914	1915	1914	1915	1914	1915
January	$14.94	$14.59	$13.23	$13.45	$13.99	$13.90
February	15.06	14.55	14.12	13.45	14.08	13.90
March	15 07	14.55	13.91	13.45	14.10	13.95
April	14.90	14.55	13.90	13.45	14.13	13.95
May	11.90	14.61	13 90	13.60	14.27	13.83
June	14.90	14.70	13.90	13.67	13.96	13.77
July	11.90	14.94	13.90	13.91	13.90	13.68
August	14.90	16.01	13.90	15.31	14.08	14.75
September	14.90	16.86	13.90	15.95	14.03	15.70
October	14.84	.....	13.75	.....	13.97	.....
November	14.59	.....	13.43	.....	13.83	.....
December	14.70	.....	13.45	.....	13.83	.....
Year	$14.88	.....	$13.78	.....	$14.01	.....